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TB 740-97-4

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

PRESERVATION OF VESSELS FOR STORAGE

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HEADQUARTERS, DEPARTMENT OF THE ARMY

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TB 740-97-4
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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

PRESERVATION OF VESSELS FOR STORAGE

Headquarters, Department of the Army, Washington, DC
30 June 1977

TB 740-97-4, 28 February 1975, is changed as follows:

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4-9 and 4-10	4-9 and 4-10
None	4-10.1(4-10.2 Blank)
4-15 and 4-16	4-15 and 4-16
4-17 and 4-18	4-17 and 4-18
None	4-18.1(4-18.2 Blank)
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6-1 and 6-2	6-1 and 6-2
B-1 and B-2	B-1 and B-2
C-1 and C-2	C-1 and C-2
E-1 and E-2	E-1 and E-2
F-1 through F-4	F-1 through F-4
G-1 through G-4	G-1 through G-4
I-1 and I-2	I-1 and I-2
J-1 and J-2	J-1 and J-2
K-1 and K-2	K-1 and K-2
L-1 and L-2	L-1 and L-2
M-1 through M-4	M-1 through M-4
N-1 and N-2	N-1 and N-2
O-1 through O-4	O-1 through O-4
P-1 through P-4	P-1 through P-4
Q-1 and Q-2	Q-1 and Q-2
S-1 through S-6	S-1 through S-6
U-1 and U-2	U-1 and U-2
V-3 and V-4	V-3 and V-4

2. File this change sheet in the front of the publication for reference purposes.

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

PAUL T. SMITH
Major General, United States Army
The Adjutant General

Distribution:

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TB 740-97-4
Change 1

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

PRESERVATION OF VESSELS FOR STORAGE

Headquarters, Department of the Army, Washington, DC
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  USAES (50)
PMS Sr Div Units (1)
MOTBA (2)
MOTBY (2)
MOTKI (2)
MOTSU (2)
EAMTMTS (2)
WAMTMTS (2)
POE (2)
USAH (2)
Army Hosp (1)
USA Dep (10)
Dep (5)
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Arsenal (5)
Div Engr (1)
Engr Dist (1)
PG (10)
Cen (5)
ATS (1)
MAAG (2)
USARMIS (1)
JUSMMAT (1)
JBUSMC (3)
USACOMZEUR (5)
USAREUR Engr Sup Con Agcy (50)
USAREUR Engr Proc Cen (5)
Engr Rgn Maint Ofc,
  San Antonio (3)
Fld Comd, DNA (8)
Sig Lab (5)
Engr FLDMS (2)
ARNG & USAR: None
For explanation of abbreviations used, see AR 310-50.

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No. 740-97-4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *28 February 1975*

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***This bulletin supersedes TB 740-93-4, 22 December 1970, including all changes.**

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CHAPTER 1

GENERAL

1. **Purpose.** The purpose of this bulletin is to provide CONUS and Oversea activities responsible for the storage of USATROSCOM ships, small craft, pontoons and floating docks, instructions and guidance relative to preservation for storage.

2. **Scope.** This bulletin is applicable to the preparation of vessels, propelled and non-propelled, 26 feet and over in length, and related supplies and equipment for long term storage. It also provides basic guidance for selection of storage condition and requirements for depreservation. The instructions contained herein pertain mainly to the prevention of deterioration by use of preservatives and dehumidification. These instructions are sufficiently general to be applicable to a wide variety of vessels.

3. **References.** A listing of instructional material and specifications applicable to this bulletin is provided in appendix A.

4. **Reporting of Equipment Publications Improvements.** The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to the Commander, US Army Troop Support Command, ATTN: AMSTS-SDP, 4300 Goodfellow Blvd., St. Louis, MO 63120.

CHAPTER 2

GENERAL INSTRUCTIONS

5. General. The following general instructions cover disassembly, matchmarking, lubrication, cleaning, drying, painting, marking, precautionary and safety measures and the use of contact preservatives and other materials involved when preserving vessels and basic issue items. Further instructions involving each detailed process may be found in the publications mentioned in the applicable paragraphs.

6. Disassembly and Matchmarking. Disassembly will be the minimum necessary to safeguard parts known to be subject to damage or loss and to allow ventilation. Bolts, nuts, and washers will be replaced on one of the mating parts and secured. Openings made by removal of components or to provide ventilation will be covered with standard gauge mesh aluminum insect screen to prevent the entry of dirt, debris, insects, rodents, snakes, etc. Parts removed during disassembly will be preserved, packaged, identified and stowed within compartments. Removed parts and mating parts remaining on the basic unit will be matchmarked identically, except where mating of parts is apparent, by stenciled letters or numerals with gasoline soluble paint conforming to MIL-P-13983. Parts which are too small to accommodate stencil marking will be identified by using metal tags, if available, or cloth shipping tags conforming to FED-UU-T-81, type A. Securely attach the tags to the parts in such a manner as to prevent damage to the preservation or to the parts being identified. The marked cloth shipping tag will be waterproofed in accordance with MIL-STD-129.

7. Lubrication. After cleaning, but prior to preserving, each vessel will be lubricated in accordance with the applicable lubrication order except those areas requiring the application of a contact preservative.

8. Cleaning and Drying. *a. Cleaning.* Equipment and components will be cleaned using the most applicable cleaning process of MIL-P-116. When possible, the entire item will be cleaned without interruption. However, when interruptions are necessary, temporary protection will be provided to the areas that have been cleaned.

(1) *Special cleaning.* Galley gear, mess gear, potable water containers and dispensers, refrigerators, and other items likely to come in contact with food and beverages must not be cleaned with any toxic material. Petroleum solvents are toxic. If it is necessary to clean food handling or potable water equipment, the items will be cleaned with soap and water to which a water-soluble compound, such as sal soda, may be added. Thorough rinsing with potable water will then be accomplished.

(2) *Field cleaning.* Processes C-1, C-3, C-14 and C-15 normally are used in field cleaning operations. Examples of mechanical means employed in the field application of process C-1 are buffing, sanding, and scratch brushing. Examples of chemical means are petroleum solvents and alkaline compounds.

(3) *Shop cleaning operations.* Cleaning operations performed within a building normally are accomplished by processes C-1, C-3, C-5, C-7, C-9, C-14, C-15 and C-18.

(4) *Fingerprint removal.* Prior to preservation, provide additional cleaning to critical and precision machined surfaces by applying process C-5 to remove fingerprints and perspriation residues.

CAUTION

DO NOT HANDLE PARTS WITH BARE HANDS AFTER CLEANING HAS BEEN ACCOMPLISHED.

(5) *Precautionary measures.* Protect items made of rubber, such as hose, and electrical insulation from petroleum solvents by shielding with greaseproof barrier material or other suitable material. Protect all items subject to damage by steam cleaning, such as generators, starters, magnetos, and distributors, by shielding with waterproof barrier material. When impracticable to properly shield the items, remove during the cleaning operations.

b. Drying. Immediately after cleaning, items will be thoroughly dried using the most applicable procedure of MIL-P-116. Air lines supplying compressed air for drying metal surfaces and for spraying paint or preservatives will be equipped with oil and water separators. These separators will be located in the air lines approximately 25 feet from the discharge end of the hose. Drain the separator and the air compressor storage tank at frequent intervals by opening the drain cocks, allowing any oil and water to drain from the units.

9. **Painting**. Painting of vessels will be in accordance with TB 43-0144.

10. **Marking**. Marking of vessels will be in accordance with MIL-STD-129.

11. **Safety Precautions**. *a. Common Hazards*. Both personnel and materiel are exposed to some hazards in nearly all preservation procedures. However, with proper care, any of the materials described herein may be used safely.

(1) *Flammability*. Many cleaning materials, preservatives and sealing compounds are flammable, some give off flammable vapors and some form explosive mixtures when the vapors combine with air. The danger is greatest when the materials are used in a confined space.

(2) *Skin irritation*. Many of the materials tend to irritate the skin upon contact, and exposure to the fumes or liquids has caused severe cases of dermatitis or other injuries. Cleaning materials are particularly hazardous in this respect.

(3) *Toxicity*. Some of the materials are mildly toxic. None of them should be inhaled in any great concentration. Spray applications are particularly dangerous.

b. Safety Program. A well planned and constantly enforced safety program will be provided. An effective safety program will place emphasis on ventilation, fire prevention and personnel safety.

(1) *Ventilation*. Adequate ventilation of work areas will be provided. Where using volatile materials in a confined space, an exhaust system will be utilized to evacuate fumes from the area.

(2) *Fire prevention*. Fire fighting equipment will be kept available at all times, and the personnel engaged in preservation will be instructed in its use. They will also be instructed as to the course of action in the event of fire. Smoking and the use of fire and open lights will be prohibited in work areas. Explosion-proof electrical switches and controls will be required on all equipment used in the vicinity of, and for the application of volatile materials. Electrically operated equipment and spray equipment will be grounded.

(3) *Personnel safety*. Personnel will be required to observe safety regulations concerning the use of respiratory masks when spraying, safety goggles when handling or working near cleaning solvents and all spray applications, and protective gloves when working with cleaning materials and preservatives.

12. **Boat Set—Basic Issue Items**. Boat sets—basic issue items are divided into four major groups consisting of operating equipment, operating supplies, on board repair parts, and accessory items. Boat set components and accessory items shall be preserved, packaged and packed in accordance with the published Packaging Data Sheet applicable for design craft. In the absence of published Packaging Data Sheets boat set component and accessory items shall be preserved, packaged and packed in accordance with MIL-P-116, MIL-R-196, PPP-P-40 and MIL-E-17555, as applicable.

13. **Contact Preservatives and Other Materials**. *a*. The P-type preservatives and the majority of packaging materials, and methods of application, specified herein, are described in MIL-P-116 and TM 38-230.

b. Application. Before applying coating and sealing materials such as bituminous coating, strippable coating, lacquer resisting synthetic primer, and pressure sensitive tape, the surfaces to which the material is to be applied will be dry and clean of oil, grease, dirt and other contamination. The following additional guides will be observed in the use of materials.

(1) *Bituminous coating*. When applied over strippable coating, bituminous coating will be sprayed or troweled to a thickness of 1/8 inch. At least 4 hours should elapse between the application of strippable and bituminous coatings. When applied directly to metal surfaces to caulk or seal a joint, the thickness of the coating will be appropriate for the application.

(2) *Desiccant (bagged)*. To minimize absorption of moisture, bagged desiccant will be kept in sealed containers until the moment it is to be placed within the area being dehumidified. Bagged desiccant will be used only for static dehumidification. The desiccant will be secured in a manner to prevent contact with metallic surfaces, and the area or item in which it is placed will be closed and sealed immediately.

(3) *Lacquer-resisting synthetic primer*. The primer is applied to metal clutch and brake drums to prevent corrosion. Clutch and brake facings will be removed or held clear of the surfaces to which the primer has been applied until it is thoroughly dry. It is not necessary to remove the primer prior to use. The first operation of the mechanism will cause the primer to be removed as a fine dust.

CAUTION

Stir or mix well. Primer has a tendency to "gum up" rather than "powder off" as a fine dust, if not thoroughly mixed prior to application.

(4) *Pressure sensitive tape*. Where the tape is applied in flat strips to bridge openings, adhesive conforming to FED-MM-A-189 will be applied to the boundaries of the area to be covered in order to improve the adhesion of the tape. Best results are obtained of the tape if the tape is applied while the compound is slightly tacky. When applied to bridge openings, it will normally be covered with strippable coating and bituminous coating, in that order.

(5) *Strippable coating*. Strippable coating will be applied by spraying to a thickness of approximately 0.040 inch, in order to obtain good resistance to water vapor transmission. Seams, joint and small apertures can be sealed best by direct application of the coating. Prior application of tape or suitable exterior grade plywood or metal blanks is desirable only for the sealing of apertures too large to be bridged by the compound. Since strippable coating at best provides only moderate resistance to water vapor, it will be overcoated with bituminous coating in all cases where it is desired to seal any opening of appreciable surface area for dehumidification.

14. Preservation Time Period. *a*. Receipts from procurement and reconditioned stocks requiring a military level of protection will normally be preserved within ten (10) work days after receipt of stock. If the prescribed level of protection cannot be accomplished within the time frame specified, interim preservation will be afforded the item to keep it in an "as is" condition.

b. Serviceable and repairable stocks on hand including retrograde receipts will be afforded the required protection to keep them in an "as is" condition. For the purpose of this publication, the term "as is" means affording the item the protection necessary to keep it from further deterioration. This may involve application of preservatives; preservation of engines and other associated components, painting, and in some cases the installation of dynamic dehumidification systems, if required.

CHAPTER 3

STORAGE INSTRUCTIONS

Section I. DRY STORAGE

15. General. Dry storage is the preferred method for storing floating equipment.

16. Storage Location. Selection of the storage site will give due consideration to the following requirements:

a. Firm level ground having adequate drainage under the prevailing year round condition.

b. Accessibility to transportation.

c. Adequate security.

d. Availability of sufficient electrical power.

17. Storage Plan. The storage plan will provide for grouping vessels by type and size in formation that will provide adequate space for placement, selection and servicing of the vessel.

18. Blocking and Cradling. The design and application of supporting structures for dry stored vessels will observe the following principles and guide lines:

a. Docking plans, line drawings, profiles, and sections of vessels will be used as guides.

b. Many well distributed supports will be used to avoid concentrated loads.

c. Hulls will be sufficiently elevated to provide good air circulation and ease of in-storage maintenance.

d. Vessels will be situated to insure good drainage.

e. Blocking will include cradles, keel blocks, bilge blocks and shoring, as applicable.

19. Storage Aboard Other Vessels. Small steel hull vessels may be stored on decks of larger, wet stored, steel hull vessels when reasonably accessible dry storage space ashore is not available.

20. Shelters for Wood and Plastic Vessels. The general characteristics of shelters for wood and plastic hulls will provide for the following:

a. Protection from rainfall and lengthy exposure to direct sunlight.

b. Maximum air circulation.

c. Shelter supports independent of the vessel.

21. Ventilation. Ventilation for vessels, not under dehumidification, will be that required to prevent condensation within the vessel. Hatches, accesses and other openings used to provide ventilation will be shielded with suitable covers or ventilators to prevent the entry of water. When wood ventilator covers and/or shelters specified herein are used for venting voids and protection of deck machinery, they will be the demountable type and will include the fabrication features as shown in figures 29, 50, and 65. The sides of ventilator covers and shelters may be constructed of nominal ½ to 5/8 inch exterior type plywood Grade A/C conforming to NN-P-530 or nominal 1 inch tongue and groove lumber. Louvered ends will be covered with standard aluminum insect screen. The interior and exterior wood surfaces of the ventilator cover including the louvers shall be painted with two (2) coats of Deck Gray paint conforming to MIL-P-699, Type A to prevent decay, delamination and dry rot. When louvered and screened openings in covers do not provide sufficient ventilation, such devices as rotating vane-type ventilators will be installed. Hull drain plugs will be removed and stowed. Shielding of installed deck equipment will be designed to promote air circulation to the item.

22. Ballast. All temporary solid type ballast such as pig iron, chain, blocks, etc., shall be removed when vessel is placed in storage.
Exception: Solid type ballast (pig iron) will remain in place on the 100 foot tugs design 3006.

Section II. WET STORAGE

23. General. Vessels will be wet stored only when dry storage is not feasible. Long term wet storage of wood hulls is particularly undersirable because of possible damage by marine organisms.

24. Storage Locations. The physical characteristics of the wet storage area will dictate the distribution and mooring of vessels. Within the limitations of the physical site, security and accessibility, vessels will be grouped in formation by type and size in locations that provide natural shelter and permit easy withdrawal of individual vessels from the group. Depth of water in the berthing areas must be sufficient to prevent grounding of the vessels under all tidal conditions. Selection of mooring devices will be governed by local conditions.

25. Ventilation. Ventilation of vessels or zones of vessels, not under dehumidification, will be that required to prevent condensation within the vessels. Hatches, accesses and other openings used to provide ventilation will be shielded with suitable covers or ventilators to prevent the entry of water. When wood ventilator covers and/or shelters specified herein are used for venting voids and protection of deck machinery, they will be the demountable type and will include the fabrication features as shown in figures 29, 50, and 65. The sides of ventilator covers and shelters may be constructed of nominal ½ to 5/8 inch exterior type plywood Grade A/C, conforming to NN-P-530 or nominal 1 inch tongue and groove lumber. Louvered ends will be covered with standard aluminum insect screen. The interior and exterior wood surfaces of the ventilator cover including the louvers shall be painted with two (2) coats of deck gray paint conforming to MIL-P-699, Type A to prevent decay, delamination and dry rot. When louvered and screened openings in covers do not provide sufficient ventilation, such devices as rotating vane-type ventilators will be installed. Shielding of installed deck equipment will be designed to promote air circulation to the item.

26. Ballast. All temporary solid type ballast such as pig iron, chain, blocks, etc., shall be removed when vessel is placed in storage.

Exception: Solid type ballast (pig iron) will remain in place on the 100 foot tugs design 3006.

27. Drydocking. Drydocking of wet stored vessels will be performed at the minimum frequency consistant with prevention of excessive deterioration. In all cases, initial drydocking will be accomplished in accordance with requirements specified in *a*, *b*, and *c* below. Differences in characteristics of berthing waters and other local variants preclude establishment of a cycle common to all storage sites. Each storage activity will develop drydocking cycles through a program of systematic sampling. Drydocking reports will be prepared by the assigned ship surveyor in accordance with AR 750-1 and TM 38-750. Required reports will be prepared upon completion of each drydocking and not later than 10 workdays following the date vessels are refloated. Preparation and distribution will be in accordance with instructions in TB 55-1900-201-45/1. Report of painting and condition of vessel bottom will be reported in accordance with AMCR 750-22. A copy of this report will be retained on-board the craft in storage or at storage area headquarters; a copy will be on the craft at time of activation; a copy furnished this Command, ATTN: AMSTS-MMM(NMP). The method of determining drydocking cycles will be generally as follows:

a. Steel Hull Vessels. Representative craft will be drydocked one (1) year after their last drydocking. Assuming that the condition of their bottoms is satisfactory, additional similar craft will be drydocked 18 months after their last drydocking. This procedure will be continued at least at twelve (12) month intervals until conclusive indications are found that the normal life expectancy of the bottom protection has been reached. Due consideration will be given to differences on paint systems and effects of location in storage of the sample craft.

b. Wood Hull Vessels. Establishment of drydocking cycles for wooden craft will follow the same general pattern as for steel hull vessels except that drydocking will commence six (6) months after the last drydocking.

c. Based on the results of the above, local Commanders may determine the frequency of continuing drydocking cycles.

27.1. Safety and Security of Wet Stored Vessels. *a*. Wet stored vessels require constant surveillance and special precautions to guard against the possibility of flooding conditions resulting from under water hull damage or failure of thru hull fittings below the waterline. The possibility of flooding or listing of wet stored vessels will be given the highest consideration by the vessel custodian.

b. Vessel custodian will assure that available means within the local area for early detection of flooding and listing conditions are employed. As a minimum, these precautions will provide:

(1) *Security inspections*. Patrol type inspections at least once daily to check mooring lines and vessel exterior.

(2) *Draft markings*. Draft markings painted fore and aft for distance observation by water and/or shore patrol.

(3) *Flooding alarms*. Flood alarm systems will be installed on all wet stored vessels except open type barges and lighters. Visible type flood alarm system lights should be visible for distance observation (approximately 1 mile). The flood alarms may be of any of the following types:

a. Styrofoam ball enclosed mercury switch type.

b. Tube type, activated by water pressure

c. Float and arm type with waterproof switch.

c. Flood alarm systems may be fabricated locally, or any of the above stock type is acceptable. Regardless of the type used, they should be simple in design and require no elaborate blueprints for installation, only a light gauge wire should be necessary between the sensing device and top side alarm. Flood alarms may be energized by shore power 110V AC, or battery powered if shore power is not available. Alarms will be tested at time of vessel closure and on a quarterly basis thereafter. Areas for consideration for installation of bilge alarm devices are:

(1) Engine room, machinery spaces and shaft alleys.

(2) Steering machinery spaces below the waterline.

(3) Each major watertight sub division of the vessel.

(4) All other compartments/spaces where flooding could occur through hull fittings without activating other installed flooding alarms aboard the vessel.

CHAPTER 4

PRESERVATION INSTRUCTIONS

Section I. PRESERVATION WITHOUT DEHUMIDIFICATION

28. General. This section outlines requirements for the preservation of vessels without the use of dehumidification equipment. The preservation methods, techniques and contact preservatives specified for use are considered adequate to protect vessels for long term storage. This method of preserving vessels will be used only when preservation with dehumidification is not feasible. Vessels preserved without dehumidification require more frequent inspection, more frequent preservation and more depreservation. Vessel components not specifically mentioned in this section will be preserved similar to those having the same operational and physical characteristics. Due to the unique design characteristics of self-elevating, barges and piers, detailed instructions for preservation and storage of these vessels are provided in appendix T.

29. Engines. *a. Combustion Chambers.* When preservation of combustion chambers is specified, the amount of preservative lubricating oil to be sprayed into each cylinder will be determined as follows:

(1) One-half ounce for each cylinder with piston displacement up to 25 cubic inches.

(2) One ounce for each cylinder with piston displacement between 25 and 50 cubic inches.

(3) One and one-half ounces for each cylinder with piston displacement between 50 and 75 cubic inches.

(4) Two ounces for each cylinder with piston displacement over 75 cubic inches.

CAUTION

Precautions will be taken to assure that the amount of oil injected into the combustion chambers and manifolds will not result in hydrostatic lockup of the engine. Prior to preserving additional engines, the first engine preserved will be allowed to stand idle for 12 hours. The engine crankshaft will then be rotated manually, or by the starting motor if manual rotation is not possible, to assure that the amount of oil injected into the combustion chambers and manifolds permits free rotation of the engine.

b. Crankcases. Prior to preservation of the fuel system and combustion chambers, the engine crankcase and the crankcase of engine accessories will be preserved as follows:

NOTE

To determine the preservation requirements for engine lubrication systems, compression-ignition and spark-ignition are divided into two categories: Low output-engines operating at output levels up to 150 psi brake mean effective pressure (bmep) and high output-engines operating at outputs levels of 150 psi (bmep) and above. Naturally asperated engines fall well below the 150 psi (bmep) range while turocharged engines are usually 150 psi (bmep) or higher. If bmep is unknown, the output category can be identified by visual inspection of the engine to determine if it is turbocharged.

(1) *Wet sump.*

(a) *Spark-ignition engines and compression-ignition engines operating at output level up to 150 psi, brake mean effective pressure (bmep).* At the beginning of engine preservation, the engine crankcase, and the crankcase of any mounted accessories having a separate crankcase from the engine, will be filled to the operating level with P-10 preservative lubricating oil, type I, grade 10, 30 or 50 as applicable. Upon completion of engine preservation, the preservative oil will remain in the crankcases. A tag will be prepared for each crankcase indicating: "THIS CRANKCASE IS FILLED TO THE OPERATING LEVEL WITH PRESERVATIVE LUBRICATING OIL GOOD FOR OPERATION UNTIL THE FIRST REQUIRED LUBRICANT CHANGE—DO NOT DRAIN—CHECK OIL LEVEL—IF LOW FILL TO THE OPERATING LEVEL WITH THE OPERATING OIL (MIL-L-2104) APPLICABLE GRADE." The tags will be attached to the crankcase fill tubes.

(b) *Compression-ignition engines operating at output levels of 150 psi (bmep) and above.* At the beginning of engine preservation, the engine crankcase, and the crankcases of any mounted accessories having a separate crankcase from the engine, will be filled to the operating level with P-10 preservative lubricating oil, type II, grade 10 or 30 as applicable. Upon completion of engine preservation, the preservative oil will remain in the crankcases. A tag will be prepared for each crankcase indicating: "THIS CRANKCASE IF FILLED TO THE OPERATING LEVEL WITH PRESERVATIVE LUBRICATING OIL GOOD FOR OPERATION UNTIL THE FIRST REQUIRED LUBRICANT CHANGE—DO NOT DRAIN—CHECK OIL LEVEL—IF LOW FILL TO THE OPERATING LEVEL WITH THE OPERATING OIL (MIL-L-2104) APPLICABLE GRADE." The tag will be attached to the crankcase fill tubes.

(2) *Dry sump.*

(a) Crankcases of air-cooled engines that are lubricated by adding lubricating oil to the fuel, P-10 preservative lubricating oil, type I, grade 10, 30 or 50 as applicable, will be added to the fuel in the ratio specified for normal operation. The engine will be started and operated at fast idle until running smoothly. The engine will then be accelerated to ¾ speed, without load, to assure coverage to all interior surfaces of the lubricating system.

(b) Air cooled dry sump engines which operate with no oil in the crankcase, the inspection plate, air box cover or the plugs will be removed from the bottom of the crankcase and the entire interior of the crankcase will be sprayed with P-10 preservative lubricating oil, type I, grade 30, while rotating the engine crankshaft for at least three complete revolutions.

c. Cooling Systems. Cooling systems including all tanks, pumps, pipes, water jackets, keel cooler and heat exchangers will be drained. Thoroughly examine the system for faulty gaskets, rubber hoses, leaks, rust, dirt, loose connections and evidence of oil seepage into the system. Systems will be cleaned and preserved as follows:

(1) *Fresh water systems.* Fresh water cooling systems will be cleaned using cleaning compound conforming to MIL-C-10597. Cleaned systems will be filled with a clean solution of equal parts by volume of ethylene glycol and water or arctic type antifreeze in accordance with table 1. To determine the percent of antifreeze required, it is necessary to consider the area where the item is being stored or shipped. The depreservation guide will be annotated to indicate the antifreeze and percentage thereof which the cooling systems contains.

Table 2. Guide for Protecting Cooling Systems

Lowest est. temp in Geographic area	Percent of		Specification	Notes
	Antifreeze	Water		
−30°F.	50	50	MIL-A-46153	1
−30° to −55°F.	60	40	MIL-A-46153	1
below −55°F.	100	0	MIL-A-11755	2

NOTE 1

Antifreeze conforming to A-A-548, type 1, may be used provided one ounce of corrosion inhibitor conforming to O-I-490 is added for each two quarts of water used in the solution.

NOTE 2

The antifreeze compound will be used without dilution.

(2) *Raw water system.* Raw water cooling systems will be flushed with clean fresh water and blown dry with dry compressed air. The system will then be flushed with preservative conforming to MIL-C-16173, grade 5, and then thoroughly drained.

NOTE

The drained grade 5 preservative may be used to preserve additional engines until it shows evidence of contamination by visible change of color, presence of rust particles and/or other foreign contamination. The presence of rust particles and other foreign contaminates can be detected by filtering a small amount of the drained compound through a suitable filter paper.

d. Fuel Systems.

(1) *Spark ignition gasoline engines.*

(a) *Engines with carburetors.* A portable container with two compartments will be positioned to provide gravity feed to the engine. One compartment will contain gasoline and the other compartment will contain type P-9 preservative oil. The engines fuel supply line will be disconnected at the most convenient point. A flexible line from the portable container will be connected to the fuel supply line leading to the engine. The container selector valve will be turned to the gasoline position. The engine will be started and operated at fast idle until running smoothly, then accelerated to ¾ speed without load. At the same time the fuel supply selector valve will be switched to the preservative oil position. The instant the oil reaches the combustion chambers (evidenced by loss of speed, misfiring, and excessive smoking) the ignition will be turned off. After the engine has stopped, the line from the portable container will be disconnected from the engine fuel supply line. The engine fuel supply line will be reconnected. Fuel filters and sediment bowls will be drained.

(b) *Engines with fuel injectors.* The injector fuel return coupling will be disconnected. A line will be connected to the injector fuel return coupling on the engine to permit draining into a recovery container. The fuel system will then be preserved as specified in (a) above. (The recovered fuel and oil mixture will not be used to preserve other fuel systems).

(2) *Compression-ignition engines (diesel and multifuel).*

(a) *Gasoline starting engines.* A portable container with two compartments will be positioned to provide gravity feed to the engine. One compartment will contain gasoline and the other compartment will contain type P-9 preservative oil. The flexible line from the portable container will be connected to the engine fuel pump intake line. The engine fuel return line will be disconnected at the quick disconnect coupling. A transparent plastic line will be connected to the disconnected engine fuel return line, and the other end will be inserted into a recovery container to collect the returned fuel. Another portable container will be provided and will contain type P-9 preservative oil. The diesel or multifuel engine fuel supply line will be disconnected at the most convenient point nearest the fuel pump. The line from the portable container will be connected to the fuel-to-engine line at the point of disconnect. Controls will be positioned for gasoline operation. The three-way valve of the two compartment container will be turned to the gasoline "ON" position. The engine will be started and operated until running smoothly. The engine speed will then be increased to ¾ speed and the container selector valve turned to the preservative oil "ON" position. Engine will be operated until it begins to misfire, and the engine controls will immediately be switched to diesel or multifuel operation. The engine will be operated at ½ speed until undiluted preservative oil is flowing into the recovery container. The engine will then be increased to ¾ speed for approximately 15 seconds and the engine then turned to "OFF" position and the lines disconnected from the engine fuel intake lines. The engine fuel intake lines will be reconnected. The temporary fuel return line will be disconnected and the permanent fuel return line reconnected. Fuel filters and sediment bowls will be drained. (The recovered fuel oil mixture will not be used to preserve other fuel systems.)

(b) *Straight diesel and multifuel engines.* The engine fuel intake line will be disconnected at the most convenient accessible point nearest the fuel supply tank. A line from a portable container containing fuel conforming to VV-F-800 will be connected to the fuel intake line leading to the engine. The injector fuel return line will be disconnected at the disconnect coupling. A transparent line will be connected to the injector fuel return coupling to allow for draining into a recovery container. The fuel valve of the portable container will be turned to the "ON" position. The engine will be started and operated at fast idle until thoroughly warm. The engine will then be accelerated to ¾ speed, at which time the fuel supply will be switched to the portable container containing type P-9 preservative oil. The engine will be operated at this speed until undiluted preservative oil is flowing into the recovery container. The engine will then be stopped. The temporary fuel return line will be disconnected and the permanent fuel return line reconnected. Fuel filters and sediment bowls will be drained. (The recovered fuel oil mixture will not be used to preserve other fuel systems).

(c) *Gasoline starting auxiliary (pony) engines.* After the attached diesel or multifuel engine has been preserved, the gasoline engines will be disengaged from the diesel or multifuel engine. The gasoline engine fuel system, combustion chambers, and valves will then be preserved as specified for spark-ignition engines.

e. Combustion Chambers and Valves.

(1) *Spark ignition engines.* After completion of the fuel system preservation, the engine will be allowed to cool to a cylinder head temperature of maximum 100 ° F., measured at the spark plug area of all cylinders. Cooling may be accelerated by induced air currents. After the engine has

cooled, the spark plugs will be removed. Care will be exercised to avoid damage to the threads, electrodes and gaskets. While cranking the engine with the starting motor, one half of the determined amount (a above) of P-10 preservative lubricating oil, type I, grade 30 will be atomized sprayed into each cylinder through each spark plug opening. The nozzle will be inserted into the combustion chamber and maximum air pressure for spraying will not exceed 25 psi. Without cranking the engine, the additional one half of the determined amount of the preservative lubricating oil specified herein, will be atomized sprayed into each cylinder through each spark plug opening, after which the crankshaft will not be rotated. The spark plug threads will be coated with the preservative lubricating oil specified herein. The spark plugs will be reinstalled. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control switch.

(2) *Compression-ignition engines (diesel and multifuel).* After the engines have cooled to a cylinder head temperature of 100° F., or less measured at the injector nozzle flange area surfaces of each cylinder, the combustion chambers and valves of compression-ignition engines will be preserved as follows:

(a) *Four-cycle spark ignition (gasoline) starting engines.* The intake manifolds, the exhaust manifolds and the rocker arm covers will be removed. The engine controls will be set for gasoline operation. The diesel or multifuel throttle will be completely closed. The spark plug wires will be disconnected. Each intake valve will be manually depressed and while each valve is held open, one fourth of the determined amount (a above) of P-10 preservative lubricating oil, type I or type II, grade 10 will be atomized sprayed into each cylinder through the intake ports. The nozzle tip will be inserted into the port. The maximum air pressure for spraying will not exceed approximately 25 psi. Each exhaust valve will then be manually depressed and while each valve is held open, one fourth of the determined amount of the same type and grade of preservative lubricating oil as specified, will be atomized sprayed through each open exhaust port into each cylinder. In addition to the determined amount, ¼ ounce of the preservative lubricating oil specified herein will be atomized sprayed into each starting valve port. With the valves released, the engine crankshaft will then be rotated until all pistons have completed a full cycle. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The spark plugs will be removed. Care will be exercised to prevent damage to the threads, electrodes, and gaskets. The spark plug threads will be coated with the preservative lubricating oil as specified. The spark plugs will be reinstalled. The exhaust manifolds and intake manifolds will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods, and the inside of the rocker arm covers will be sprayed with the preservative lubricating oil specified. The rocker arm covers will be reinstalled using new gaskets, if the ones originally used show evidence of damage. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER." The tag will be attached near the engine start controls.

(b) *Four-cycle, straight diesel or multifuel engines.*

1. Engines with compression release start feature. The intake manifolds, the exhaust manifolds, and the rocker arm covers will be removed. The fuel throttle will be completely closed. Each intake valve will be manually depressed, and while each valve is held open, one fourth of the determined amount (a above) of P-10 preservative lubricating oil, type I or type II, grade 10, will be atomized sprayed into each cylinder through each open intake port. The nozzle tip will be inserted into the open port. The maximum air pressure for spraying will not exceed approximately 25 psi. Each exhaust valve will then be manually depressed, and while each valve is held open, one fourth of the determined amount of the preservative lubricating oil will be atomized sprayed into each cylinder through each open exhaust port. The compression release will be set in the "OFF" position. With the valves released, the engine crankshaft will be rotated with the starting motor until all pistons have completed a full cycle. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The exhaust manifolds and intake manifolds will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods, and the inside of the rocker arm covers will be atomized sprayed with preservative lubricating oil. The rocker arm covers will be reinstalled, using new gaskets if the ones originally used show evidence of damage. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL

ISSUED TO THE USER". The tag will be attached near the engine start controls.

2. Engines without compression release start feature. The combustion chambers and valves will be preserved as specified in *1* above. EXCEPTION: Due to tendency of the engine to fire and run on the preservative lubricating oil, the crankshaft will be rocked with the starting motor in lieu of continuous rotation.
The engine will be tagged as specified in *1* above.

(c) *Two cycle engines.*

1. Engines with intake ports and valves. The fuel throttle will be completely closed. The air box covers on the side of the engine opposite the blower will be removed. The exhaust manifolds and the rocker arm covers will be removed. The engine crankshaft will be rotated with the starting motor until the piston in the cylinder to be sprayed is below the intake port. The spray nozzle will be inserted into the open port. Maximum air pressure will not exceed approximately 25 psi. One-half of the determined amount (a above) of P-10 preservative lubricating oil, type I or II, grade 10 will be sprayed into the open port. The preservation cycle will be performed on each cylinder until all cylinders have been atomized sprayed with the preservative lubricating oil, after which the crankshaft will not be rotated. With each exhaust valve manually depressed, the remaining one-half of the determined amount of preservative lubricating oil, will be atomized sprayed through each open exhaust valve port. The interior of the air box covers will be coated with preservative lubricating oil as specified. The air box covers will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The exhaust manifolds will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods and the inside of the rocker arm covers will be atomized sprayed with preservative lubricating oil as specified. The rocker arm covers will be reinstalled using new gaskets, if the ones originally used show evidence of damage. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control.

2. Engines without valves. The fuel throttle will be completely closed. The exhaust manifolds will be removed. The engine crankshaft will be rotated until the piston in the cylinder to be sprayed is below the exhaust port. The spray nozzle will be inserted into the open exhaust port. Maximum air pressure will not exceed approximately 25 psi. One half of the determined amount (a above) of P-10 preservative lubricating oil, type I or II, grade 10 will be atomized sprayed through the open exhaust port. The crankshaft will be rotated until each cylinder has been sprayed through its open exhaust port. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The exhaust manifolds will be reinstalled using new gaskets, if the ones originally used show evidence of damage. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control.

30. Air Cleaners. *a. Oil Bath Type.* Oil bath type air cleaners will be filled to operating level with P-10 preservative lubricating oil, type I or II, grade 30. Unpainted surfaces above operating level will be coated with the same type and grade of preservative.

b. Dry Type. After engine has been processed, when equipped with a dry type removable filtering element, the element will be removed. The interior surfaces will be atomized sprayed with P-10 preservative lubricating oil, type I or II, grade 30. The metallic elements will be dipped in the same type and grade preservative and the excess preservative allowed to drain prior to installation. Element will be reinstalled. Caution will be exercised to prevent preservative from contacting nonmetallic surfaces and the felt of the felt type elements.

31. Governors. *a. Hydraulic Type.* Hydraulic systems will be filled to operating level with approved operating fluid.

b. Wet Type Mechanical. Prior to engine preservation, wet type mechanical governors having separate lubricating systems, will be drained of operating lubricant and filled to operating level with P-10 preservative lubricating oil, type I or II, grade 30.

c. Dry Type Mechanical. Dry type governor mechanism, such as weights, springs, pins, linkage and other parts or assemblies within the governor housing will be sprayed with P-10, preservative lubricating oil, type I or II, grade 30. Governor control linkage, devices, and pins not inclosed within the governor housing will be coated with type P-2 preservative.

32. Reduction Gears. *a. Hydraulic Type.* Prior to engine preservation, the hydraulic reduction gear systems will be inspected for proper fluid level and contamination. Add approved fluid to bring to operating level, or if contaminated, drain and flush with operating fluid. Cleaned systems will be filled to operating level with approved fluid and operated during the preservation cycle of the engine. Any exposed exterior ferrous surfaces of the hydraulic systems will be coated with P-10, preservative lubricating oil, type I or II, grade 30.

b. Mechanical Type. Mechanical reduction gears having separate lubricating systems will be inspected for level of lubricant and for evidence of water and contamination of lubricant. Add lubricant specified by the applicable lubrication order to raise existing lubricant to operating level, or if contaminated, drain the lubricant and flush the gear housing with type P-3 preservative. Agitate with dry compressed air and thoroughly drain. The cleaned gear case will be filled to operating level with approved lubricant and operated under no load to insure coating of all interior surfaces and components. If impracticable to operate, agitate the lubricant with dry compressed air sufficiently to insure coverage of gears and internal parts of the housing. The flexible tube employed for air agitation will be of a smaller diameter than the opening of the housing so that pressure will be released simultaneously with the agitation process.

33. Inclosed Gears. Oil lubricated gears not otherwise provided for will be inspected for level of lubricant and for evidence of water and contamination of lubricant. Add lubricant specified by the applicable lubrication order to raise existing lubricant to operating level or if contaminated, drain the lubricant, flush the gear housing with type P-3 preservative. Agitate with dry compressed air and thoroughly drain. The cleaned gear case will be filled to operating level with approved lubricant and operated under no load to insure coating of all interior surfaces and components. If impracticable to operate, agitate the lubricant with dry compressed air sufficiently to insure coverage of gears and internal parts of the housings. The flexible tubing employed for air agitation will be of a smaller diameter than the opening of the housing so that pressure will be released simultaneously with the agitation process.

34. Exposed Gears. Non-precision exposed gears subjected to the weather will be coated with type P-1 preservative. All other exposed gears will be coated with type P-2 preservative.

35. Drive Belts and Pulleys. The tension of all drive belts will be released. Pulley grooves will be coated with a thin film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664.

36. Exposed Drive Chains. Exposed drive chains will be coated with type P-3 preservative. Sufficient time will be allowed for excess preservative to drain from the chain. After draining the chain will be coated with type P-11 preservative.

37. Clutches and Related Components. Drive clutches and related components will be preserved as follows:

a. Dry Disc Type. Cover plates will be removed and the clutch disengaged. All accessible interior components of the clutch will be coated with a thin film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664. Spring loaded disc type clutches will be blocked or secured in a partially disengaged position to eliminate contact between the disc facing and pressure plates. Do not block spring loaded clutches entirely open, because prolonged complete depression of clutch springs will cause loss of tension. Clutch equipped with snap-over-center or toggle-in devices will be completely disengaged.

b. Band and Shoe Type. Clutch drum facings, clutch control mechanisms inclosed within housings, and exposed clutch control mechanisms will be coated with a thin film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664.

c. Cone Type. Coat the unlined surface of cone type clutches, clutch control mechanism inclosed within housings, and exposed clutch control mechanisms with rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664.

d. Jaw Type. Coat clutch jaws, shifter yokes, and machined surfaces of shafts with type P-2 preservative. Coat unpainted exposed surfaces of clutch control mechanism enclosed within housing with rust inhibiting lacquer resisting synthetic primer conforming to FED-TT-P-664.

e. Clutch Air Cylinder. The drain plug will be removed and type P-9 preservative will be atomized sprayed into the cylinder through the drain plug opening. The plug will be reinstalled. The exposed surfaces of the piston rod will be coated with type P-11 preservative.

f. Hydraulic Clutch Control. Where the clutch is operated by a hydraulic system, the hydraulic housing will be filled to operating level with approved operating fluid. The exposed surfaces of the piston rod will be coated with type P-11 preservative.

38. Brakes. *a. Hydraulic Brake Systems.* The hydraulic system will be filled to operating level with approved hydraulic fluid required by the applicable lubrication order or technical manual.

The brake disc and/or brake drum facings and control mechanisms will be coated with a thin film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664. Care will be exercised to prevent primer from coming in contact with the brake lining and rubber impregnated parts.

b. Mechanical Control Brake Systems. Preserve component parts of mechanical control systems such as gears, shafts, bushings, and bearings within housing in accordance with paragraph 33. Coat exposed unpainted metal parts and surfaces of the systems with rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664.

c. Parking Brake Systems. Coat the unpainted metal surfaces of pins, levers, linkage, return springs, pulley grooves, braking surfaces, lining carriers and similar parts with a thin film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664, Coat brake cables with lubricant conforming to type II, grade B of FED-VV-L-751.

39. Air Compressors. The operating lubricant will be drained from the compressor crankcase and the crankcase filled with P-10, preservative lubricating oil, type I or II, grade 30. The air line will be disconnected from the compressor. The air cleaner will be removed and, while the compressor is being operated, 4 or 5 ounces of P-10 preservative lubricating oil, type I or II, grade 30 will be sprayed into the air intake. The compressor will be operated a sufficient length of time to assure coverage of all internal surfaces. The air cleaner and line will be reinstalled.

40. Tanks. *a. Gasoline, Diesel and Oil Tanks.* Gasoline, diesel and oil tanks will be drained, cleaned and preserved using the fill and drain method or the drain and spray method of preservation.

(1) *Fill and drain method.* Tanks not equipped with access other than filler openings will be completely filled with P-10 preservative lubricating oil, type I or II, grade 30 and then drained. Drain plugs will be coated with the same type and grade of preservative and reinstalled. Drained preservative may be reused for processing other fuel tanks provided not more than 10 percent of the resultant fluid is fuel or oil.

(2) *Drain and spray method.* Tanks equipped with access other than filler openings will be atomized sprayed with P-10 preservative lubricating oil, type 1 or II, grade 30 using atomizing equipment which will assure complete coverage of all interior surfaces. Excess preservative accumulated during spraying operation will be drained. Drain plugs will be coated with same type and grade of preservative and reinstalled.

b. Water Tanks. Raw water tanks will be flushed with fresh water. All water tanks will be thoroughly dried. Contact preservatives will not be required, but ventilation will be provided.

c. Air Tanks. Air tanks will be dried of all moisture and atomized sprayed with P-10 preservative lubricating oil, type I or II, grade 30. Excessive preservative accumulated during the spraying operation will be drained from the tank. Drain plugs will be coated with the same type and grade of preservative and reinstalled.

41. Pumps (Other Than Engine Mounted).

a. Raw Water Pumps. Raw water pumps will be flushed with fresh water and dried with clean dry compressed air. The pumps will be flushed with type P-3 preservative. The preservative will be drained and the drain plug coated with the preservative and reinstalled.

b. Potable Water Pumps. Potable water pumps will be drained and dried with clean dry compressed air. Coat the interior surfaces of potable water pumps with type P-14 preservative. Pumps will be left open as much as possible to permit ventilation. Removed drain plugs will be packaged method IC-1, identified and secure to the pump.

c. Fuel and Oil Pumps. Fuel and oil pumps will be flushed with petroleum solvent and dried with dry compressed air. The pumps will be completely filled with P-10, preservative lubricating oil, type I or II, grade 30. The preservative will remain in the pumps.

d. Pump Packing and Exterior Ferrous Surfaces. Upon completion of preservation, all pump packing, except fuel and oil pumps, will be removed and packaged method IC-1, identified and secured to the pump. Exterior unpainted ferrous surfaces such as drive shafts, couplings and packing glands will be coated with type P-2 preservative, except water pumps. Shafts, couplings and packing glands of water pumps will be coated with type P-14 preservative.

42. Oil Purifiers and Filters. Oil purifying and filtering equipment will be drained. Oil sides will be cleaned with petroleum solvent, dried and coated with P-10, preservative lubricating oil, type I or II, grade 30. Permanent metallic scraper type filters will be cleaned, as specified above, dried and coated with P-10 preservative lubricating oil, type I or II, grade 30.

43. Heat Exchanger. Raw water sides will be flushed with clean fresh water, dried and flushed with type P-3 preservative. All excess preservative will be drained. Potable or domestic water sides will be drained, flushed and thoroughly dried. No preservation will be applied to the potable or domestic water sides of the exchangers but they will remain open as much as feasible to permit ventilation. When possible, end covers will be stowed in the off set position. Surfaces normally in contact with oil, such as oil sides of oil cooler, will be flushed with P-10 preservative lubricating oil, type I or II, grade 30. All excess preservative will be drained.

44. Refrigerating Units. Refrigerant will be pumped into reservoirs, leaving sufficient pressure in the system to prevent the entry of air. Sealed systems will not be disturbed. No preservation will be applied to the interior surfaces of refrigerant systems including refrigerant compressor. Interior compartments of walk-in coolers, reefer sections, and cold storage compartments will not be cleaned or preserved with any toxic type preservatives. Unprotected, bare ferrous metal surfaces, requiring a contactpreservative, will be coated with Type P-14 preservative conforming to MIL-P-116, or Phenolic primer conforming to MIL-P-12742, Type I. Wood surfaces within the cooler or cold storage compartments, requiring a preservative, will be coated with Phenolic primer conforming to MIL-P-12742, Type II. The compressor crankcase will be filled to operating level with approved operating lubricant. All bare exterior ferrous metal surfaces of the compressor will be coated with P-10 preservative lubricating oil, Type I or II grade 30.

45. Electrical Equipment. *a. Rotating Electrical Equipment.* Explosion-proof motors and generators specially constructed for marine use, can endure a lengthy exposure to humidity without deterioration. Ferrous metal slip rings will be coated with type P-11 preservative.

b. Switchboards, Panels, and Controllers. Switchboards, panels and controllers will be cleaned using the most applicable process of MIL-P-116. Ferrous metal bus bars and other ferrous surfaces, not requiring removal or preservatives for activation, will be coated with petrolatum. Petrolatum will not be applied to contact surfaces of switches, points or terminals. Switchboards and panels will be ventilated.

c. Receptacles. Receptacles exposed to the weather will be sealed against entrance of water by applying water-proof pressure-sensitive tape between the receptacles and its cover. Receptacles in compartments will not be sealed.

d. Gages and Instruments. Gages and instruments will be cleaned using the most applicable process of MIL-P-116. No preservative materials will be applied to gages and instruments.

e. Horns, Bells, Buzzers, Navigational and Flood Lights. All external mounted horns, bells, buzzers, navigational and flood lights, provided with waterproof protection will be removed, packaged in accordance with the most applicable method of MIL-P-116, identified, and stowed within compartments. Bare exterior ferrous surfaces of removed or mounted units will be coated with type P-1 preservative.

46. Heating Boilers. The hot water heating boilers will be cleaned and thoroughly dried with dry compressed air. Drain plugs will be removed and lines disassembled sufficiently to effect complete draining of water. Fire sides of boilers will be cleaned and coated with type P-10 preservative lubricating oil, type I or II, grade 30. Lines disassembled for draining will be reinstalled.

47. Oil Burners. *a. Pot Type.* The fuel supply line will be disconnected and the carburetor will be flushed with type P-9 preservative. The interior ferrous surfaces of the burner pot will be sprayed with P-10 preservative lubricating oil, type I or II, grade 30. Fuel lines will be reinstalled.

b. Atomizing Type. The fuel system, from the suction side of the fuel pump, and the atomizing air system, from the atomizing shutoff valve, will be filled with type P-9 preservative and drained. The atomizer will be removed from the burner, disassembled, cleaned and coated with P-10 preservative lubricating oil, type I or II, grade 30. The atomizer will then be reassembled and reinstalled.

48. Valves. *a. Weather Exposed Valves.* Weather exposed valves will be turned to full open position, the stems will be coated with type P-2 preservative, and the valves will then be closed. Unpainted ferrous metal surfaces remaining exposed will be coated with type P-1 preservative.

b. Sea Valves and Overboard Discharge Valves. Sea valves and overboard discharge valves will be secured in a closed position with wire to prevent accidental opening. Sea strainer baskets will be cleaned and coated with type P-3 preservative. The baskets will be left in place and strainer covers left in a closed position on wet stored vessels and in an open position on dry stored vessels.

c. Other Valves Within Compartments. Packing gland nuts will be loosened and the valves will be left in an open position.

49. Capstans, Winches and Windlasses. The above deck portions of capstans, winches and windlasses such as exposed gears and pinions will be coated with type P-2 preservative. Gear boxes will be filled to operating level with P-10 preservative lubricating oil, type I or II, grade 30. The gears will be turned to insure distribution to the preservative throughout the assembly. If turning of the gears is not practical, the upper parts of the assembly will be preserved by atomized spraying with P-10, preservative lubricating oil, type I or II, grade 30 or by completely filling the gear box with the preservative and draining to operating level. Brake bands and drums will be preserved in accordance with paragraph 38. All exposed ferrous surfaces of shafts, linkages and threaded adjustment will be coated with type P-2 preservative. Shelters will be constructed and placed over the entire units in a manner to protect from entry of water but to permit ventilation. The shelters shall be painted as specified and shall incorporate the fabrication features as specified herein. Drive units for capstans, winches and windlasses, separate from the main drive unit of the vessel will be preserved as specified for similar units.

50. Piping Systems. Prior to preservation, all piping systems will be drained and blown dry with compressed air. Drain plugs, unions, and flanges that are disconnected or removed to assure complete draining will be reinstalled.

a. Raw Water. Raw water piping systems will be thoroughly flushed with fresh water, drained and blown dry with dry compressed air, then flushed with type P-3 preservative and the excess preservative drained.

b. Fresh Water. No preservatives will be introduced into the fresh water piping systems.

c. Fuel and Oil. Fuel and oil piping systems will be flushed with P-10 preservative lubricating oil, type I or II, grade 30, and the excess preservative drained.

51. Davits. Davits not removed from decks will be secure. Threaded unpainted surfaces will be coated with type P-11 preservative. Bearing surfaces and threads of removed davits will be coated with type P-11 preservative and stowed under shelter.

52. Deck Fittings. Threaded surfaces of deck plates and plugs will be coated with type P-11 preservative and reinstalled. Recessed fittings will be coated with type P-11 preservative and the recess sealed against the entry of water using tape and strippable coating.

53. Davits, Staff and Stanchion Sockets and Bearings. Sockets and sleeve type bearings for the support of davits and similar type components will be coated with type P-11 preservative and sealed against the entry of water using caps, plugs or tape, and strippable coating.

54. Anchors. Anchors easily lifted to the deck will be disconnected from the anchor chain and secured in an appropriate location on the deck. Spare anchors will be secured in the storage facilities provided. Any bare ferrous surfaces of the anchor or its fittings, not normally painted, will be protected with a coating of type P-1 preservative. Detached anchor chains will be stowed in the chain lockers.

55. Wire Rope, Rigging and Fittings. *a. Rigging.* Standing rigging and related fittings will be cleaned and coated with lubricant conforming to type II, grade B, of FED-VV-L-751. Threaded fittings such as turnbuckles and shackles will be turned sufficiently to assure a coating of preservative on the mating threaded surfaces. Areas of turnbuckles fitted with protective cover will be coated with the lubricant. Rigging not required for support of masts and other components will be coated with the lubricant and stowed below deck or in sheltered areas.

b. Wire Rope on Drums or Reels. Wire rope on drums of winches and similar gear will be unwound, coated with lubricant conforming to type II, grade B of FED-VV-L-751. The exposed unpainted surfaces of the drum will be coated with the lubricant and the wire rope will be rewound on the drum. A shelter of wood or metal provided with adequate ventilation will be utilized in those instances where reels or drums cannot be stowed in sheltered areas. Wood shelters shall be painted and shall incorporate the fabrication features as specified herein.

56. Steering Systems. Unpainted surfaces of quadrants, rods, linkages, and fittings exposed to the weather will be coated with type P-1 preservative. Exposed cables will be coated with lubricant conforming to type II, grade B of FED-VV-L-751. Prior to preservation of hydraulic controlled steering system, rudders will be positioned in a manner that will retract actuating rods of hydraulic rams as far as possible. Exposed surfaces of rods will then be coated with type P-2 preservative. Electrical and geared components of steering systems will be preserved in accordance with the applicable instructions for such items.

57. Machine Tools. Machine tools will be preserved in accordance with MIL-STD-107.

58. Galley Equipment. Preservatives will be applied to those surfaces of galley equipment which are vulnerable to corrosion. Galley equipment such as food handling and processing equipment and mess gear will be preserved using type P-14 preservative. Refrigerators and stoves will be cleaned using the most applicable process of MIL-P-116 and will be opened for ventilation. Oil burners of galley ranges will be preserved in accordance with paragraph 47. Firesides of stoves will be coated with type P-10 preservative lubricating oil, type I or II, grade 30.

59. Seat Cushions and Backs. Seat cushions and backs will be wrapped or shrouded with 6 mil thickness of polyethylene conforming to type I, grade A, finish 2 of FED-L-P-378. Cushions easily removed will be wrapped and reinstalled. Seat backs or cushions not readily removable will be shrouded and the shroud secured in a manner to preclude its loss or damage.

60. Sanitary Facilities. Ferrous metal lavatory, shower and toilet piping not connected to the potable water system will be flushed with type P-3 preservative and thoroughly drained. Care will be taken that the preservative does not remain in traps. Disassembled lines, traps and drain plugs removed to facilitate draining will be reinstalled.

61. Fixed Fire Fighting System. All ferrous metal surfaces will be coated with type P-11 preservative. Release mechanism of the system will be wired to prevent accidental discharge.

62. Unprotected Exposed Metal Surfaces and Linkages. *a. Precision.* Coat unprotected ferrous metal machined precision surfaces and linkages with type P-6 or P-11 preservative compound.

b. Non-Precision. Coat unprotected ferrous metal non-precision surfaces and linkages with type P-1 preservative.

62.1 Thru Hull Fittings/Sea Connections. Thru hull fittings/sea connections for dry stored vessels will be preserved as follows:

a. Interior surfaces of thru hull fittings/sea connections shall be cleaned and free of dirt, rust, scale, and other foreign matter. Cleaned surfaces shall be preserved with type P-2 or P-3 preservative.

b. The thru hull fittings/sea connections at the hull exterior will be masked with pressure-sensitive tape, conforming to PPP-T-60, Type IV and coated with strippable and bituminous coating. The strippable and bituminous coating shall extend beyond the edges of the tape. A solid wood plug or blank may be used in place of the tape at the discretion of the storing activity.

62.2 Door Hinges and Dogs. Door hinges, fasteners and dog bearings shall be thoroughly coated with type P-2 preservative and the excess wiped away.

Section II. PRESERVATION WITH DYNAMIC DEHUMIDIFICATION (W/O COCOON)

63. General. *a.* This section contains instruction for preservation with dynamic dehumidification without cocoon. This method of dehumidification will be accomplished by sealing of zones and installation of dynamic dehumidification equipment, as outlined in chapter 6.

b. Preservative with static dehumidification is a method that may be required in some isolated instances where dynamic dehumidification is not feasible. Since a satisfactory barrier can seldom be created around fixed eqiupment of vessels, this type of dehumidification is not recommended for general use.

64. Engines. *a. Combustion Chambers.* When preservation of combustion chambers is specified, the amount of preservative lubricating oil to be sprayed into each cylinder will be determined as follows:

(1) One-half ounce for each cylinder with piston displacement up to 25 cubic inches.

(2) One ounce for each cylinder with piston displacement between 25 and 50 cubic inches.

(3) One and one-half ounces for each cylinder with piston displacement between 50 and 75 cubic inches.

(4) Two ounces for each cylinder with piston displacement over 75 cubic inches.

CAUTION

Precaution will be taken to assure that the amount of oil injected into the combustion chambers and manifolds will not result in hydrostatic lock-up of the engine. Prior to preserving additional engines, the first engine preserved will be allowed to stand idle for 12 hours. The engine crankshaft will be rotated manually, or by the starting motor if manual rotation is not possible, to assure that the amount of oil injected into the combustion chambers and manifolds permit free rotation of engine.

b. Crankcases. Prior to preservation of the fuel system and combustion chambers, the engine crankcase and the crankcase of engine accessories will be preserved as follows:

(1) *Wet sump.*

(a) Spark ignition engines and compression ignition engines operating at output level up to 150 psi, brake mean effective pressure (BMEP). At the beginning of engine preservation, the engine crankcase and the crankcases of any mounted accessories having a separate crankcase from the engine, will be filled to the operating level with P-10 preservative lubricating

oil, type I, grade 10, 30 or 50 as applicable. Upon completion of engine preservation, the preservative oil will remain in the crankcases. A tag will be prepared for each crankcase indicating: "THIS CRANKCASE IS FILLED TO THE OPERATING LEVEL WITH PRESERVATIVE LUBRICATING OIL GOOD FOR OPERATION UNTIL THE FIRST REQUIRED LUBRICANT CHANGE—DO NOT DRAIN—CHECK OIL LEVEL—IF LOW, FILL TO THE OPERATING LEVEL WITH THE OPERATING OIL (MIL-L-2104) APPLICABLE GRADE)." The tags will be attached to the crankcase fill tubes.

(b) *Compression ignition engines operating at output levels of 150 psi (bmep) and above.* At the beginning of the engine preservation, the engine crankcase and the crankcases of any mounted accessories having a separate crankcase from the engine, will be filled to the operating level with P-10 preservative lubricating oil, type II, grade 10 or 30 as applicable. Upon completion of engine preservation, the preservative oil will remain in the crankcases. A tag will be prepared for each crankcase indicating: "THIS CRANKCASE IS FILLED TO THE OPERATING LEVEL WITH PRESERVATIVE LUBRICATING OIL GOOD FOR OPERATION UNTIL THE FIRST REQUIRED LUBRICANT CHANGE—DO NOT DRAIN—CHECK OIL LEVEL— IF LOW FILL TO THE OPERATING LEVEL WITH THE OPERATING OIL (MIL-L-2104) APPLICABLE GRADE." The tag will be attached to the crankcase fill tubes.

(2) *Dry sump.*

(a) Crankcases of air cooled engines that are lubricated by adding lubricating oil to the fuel, P-10 preservative lubricating oil, type I, grade/, 10, 30 or 50 as applicable will be added to the fuel in the ratio specified for normal operation. The engine will be started and operated at fast idle until running smoothly. The engine will then be accelerated to ¾ speed, without load, to assure coverage of all interior surfaces of the lubricating system.

(b) Air cooled dry sump engines which operate with no oil in the crankcase, the inspection plate, air box cover, or the plugs will be removed from the bottom of the crankcase and the entire interior of the crankcase will be sprayed with P-10 preservative lubricating oil, type I, grade 30, while rotating the engine crankshaft for at least three complete revolutions.

c. Cooling Systems. Cooling systems including all tanks, pumps, pipes, water jackets, keel coolers and heat exchangers will be drained. Thoroughly examine the system for faulty gaskets, rubber hoses, leaks, rust, dirt, loose connections and evidence of oil seepage into the system. Systems will be cleaned and preserved as follows:

(1) *Fresh water systems.* Fresh water cooling systems will be cleaned using cleaning compound conforming to MIL-C-10597. Cleaned systems will be blown dry with dry compressed air. Filler caps and drain plugs will be left open to provide ventilation. Removed caps and plugs will be bagged, identified and secured on or near the point of installation.

(2) *Raw water systems.* Raw water systems will be flushed with fresh water and blown dry with dry compressed air. Circulation of air through the system will be provided by removal of filler caps, drain plugs and open valves. Extensive disassembly of piping will not be accomplished to provide ventilation.

d. Fuel Systems.

(1) *Spark-ignition gasoline engines.*

(a) *Engines with carburetors.* A portable container with two compartments will be positioned to provide gravity feed to the engine. One compartment will contain gasoline and the other compartment will contain type P-9 preservative oil. The engines fuel supply line will be disconnected at the most convenient point. A flexible line from the portable container will be connected to the fuel supply line leading to the engine. The container selector valve will be turned to the gasoline position. The engine will be started and operated at fast idle until running smoothly, then accelerated to ¾ speed without load. At the same time, the fuel supply selector valve will be switched to the preservative oil position. The instant the oil reaches the combustion chambers (evidenced by loss of speed, misfiring, and excessive smoking) the ignition will be turned off. After the engine has stopped, the line from the portable container will be disconnected from the engine fuel supply line. The engine fuel supply line will be reconnected. Fuel filters and sediment bowls will be drained.

(b) *Engines with fuel injectors.* The injector fuel return coupling will be disconnected. A line will be connected to the injector fuel return coupling on the engine to permit draining into a recovery container. The fuel system will then be preserved as specified in (a) above. (The recovered fuel and oil mixture will not be used to preserve other fuel systems).

(2) *Compression-ignition* and *multifuel) engines (2 and 4 cycle).*

(a) *Gasoline starting engines.* A portable container with two compartments will be positioned to provide gravity feed to the engine. One compartment will contain gasoline and the other compartment will contain type P-9 preservative oil The flexible line from the portable container will be connected to the engine fuel pump intake line. The engine fuel return line will be disconnected at the quick disconnect coupling. A transparent plastic line will be connected to the disconnected engine fuel return line and the other end will be inserted into a recovery container to collect the returned fuel. Another portable container will be provided and will contain type P-9 preservative oil. The diesel or multifuel engine fuel supply line will be disconnected at the most convenient point nearest the fuel pump. The line from the portable container will be connected to the fuel-to-engine line at the point of disconnect. Controls will be positioned for gasoline operation. The three way valve of the two compartment container will be turned to the gasoline "ON" position. The engine will be started and operated until running smoothly. The engine speed will then be increased to ¾ speed and the container selector valve turned to the preservative oil "ON" position. Engine will be operated until it begins to misfire, and the engine controls will immediately be switched to diesel or multifuel operation. The engine will be operated at ½ speed until undiluated preservative oil is flowing into the recovery container. The engine will then be increased to ¾ speed for approximately 15 seconds and the engine then turned off. Portable container valves will be turned to "OFF" position and the lines disconnected from the engine fuel intake lines. The engine fuel intake lines will be reconnected. The temporary fuel return line will be disconnected and the permanent fuel return line reconnected. Fuel filters and sediment bowls will be drained. (The recovered fuel oil mixture will not be used to preserve other fuel systems).

(b) *Straight diesel and multifuel engines.* The engine fuel intake line will be disconnected at the most convenient accessible point nearest the fuel supply tank. A line from a portable container containing fuel conforming to VV-F-800 will be connected to the fuel intake line leading to the engine. The injector fuel return line will be disconnected at the disconnect coupling. A transparent line will be connected to the injector fuel return coupling to allow for draining into a recovery container. The fuel valve of the portable container will be turned to the "ON" position. The engine will be started and operated at fast idle until thoroughly warm. The engine will then be accelerated to ¾ speed, at which time the fuel supply will be switched to the portable container containing type P-9 preservative oil. The engine will be operated at this speed until undiluted preservative oil is flowing into the recovery container. The engine will then be stopped. The temporary fuel return line will be disconnected and the permanent fuel return line reconnected. The temporary fuel intake line will be disconnected and the permanent fuel intake line reconnected. Fuel filters and sediment bowls will be drained (The recovered fuel oil mixture will not be used to preserve other fuel systems).

(c) *Gasoline starting auxiliary (pony) engines.* After the attached diesel or multifuel engine has been preserved, the gasoline engines will be disengaged from the diesel or multifuel engine. The gasoline engine fuel system, combustion chambers, and valves will then be preserved as specified for spark ignition engines.

e. Combustion Chambers and Valves.

(1) *Spark ignition engines.* After completion of the fuel system preservation, the engine will be allowed to cool to a cylinder head temperature of a maximum 100 ° F, measured at the spark plug area of all cylinders. Cooling may be accelerated by induced air currents. After the engine has cooled, the spark plugs will be removed. Care will be exercised to avoid damage to the threads, electrodes and gaskets. While cranking the engine with the starting motor, one half of the determined amount (*a* above) of P-10, preservative lubricating oil, type I or II, grade 30 will be atomized sprayed into each cylinder through each spark plug opening. The nozzle will be inserted into the combustion chamber and maximum air pressure for spraying will not exceed 25 psi. Without cranking the engine, the additional one half of the determined amount of the preservative lubricating oil specified will be atomized sprayed into each cylinder through each spark plug opening, after which the crankshaft will not be rotated. The spark plug threads will be coated with the preservative lubricating oil specified herein. The spark plugs will be reinstalled. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control switch.

(2) *Compression ignition engines (diesel and multifuel).* After the engines have cooled to a cylinder head temperature of 100°F. or less, measured at the injector nozzle flange area surfaces of each cylinder, the combustion

chambers and valves of compression-ignition engines will be preserved as follows:

(a) *Four cycle spark ignition (gasoline) starting engines.* The intake manifolds, the exhaust manifolds and the rocker arm covers will be removed. The engine controls will be set for gasoline operation. The diesel or multifuel throttle will be completely closed. The spark plug wires will be disconnected. Each intake valve will be manually depressed, and while each valve is held open, one fourth of the determined amount (*a* above) of P-10 preservative lubricating oil, type I or II, grade 10 will be atomized sprayed into each cylinder through the intake ports. The nozzle tip will be inserted into the port. The maximum air pressure for spraying will not exceed approximately 25 psi. Each exhaust valve will then be manually depressed and while each valve is held open, one fourth of the determined amount of the same type and grade of preservative lubricating oil specified will be atomized sprayed through each open exhaust port into each cylinder. In addition to the determined amount, ¼ ounce of the preservative lubricating oil specified herein will be atomized sprayed into each starting valve port. With the valves, released, the engine crankshaft will then be rotated until all pistons have completed a full cycle. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The spark plugs will be removed. Care will be exercised to prevent damage to the threads, electrodes, and gaskets. The spark plug threads will be coated with the preservative lubricating oil as specified. The spark plugs will be reinstalled. The exhaust manifolds and intake manifolds will be reinstalled using new gaskets, if the new ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods, and the inside of the rocker arm covers will be sprayed with the preservative lubricating oil as specified. The rocker arm covers will be blocked open in place with spacers ¼ to ½ inch to permit circulation of dry air over the rocker arm mechanism. If wood or metal spacers dissimilar to the block or cover are used, they will be insulated at point of contact with barrier material conforming to MIL-B-121, grade A. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached to the engine start controls.

(b) *Four cycle, straight diesel or multifuel engines.*

1. Engines with compression release start feature. The intake manifolds, the exhaust manifolds, and the rocker arm covers will be removed. The fuel throttle will be completely closed. Each intake valve will be manually depressed, and while each valve is held open, one fourth of the determined amount (*a* above) of P-10, preservative lubricating oil, type I or II, grade 10, will be atomized sprayed into each cylinder through each open intake port. The nozzle tip will be inserted into the open port. The maximum air pressure for spraying will not exceed approximately 25 psi. Each exhaust valve will then be manually depressed and while each valve is held open, one fourth of the determined amount of the preservative lubricating oil will be atomized sprayed into each cylinder through each open exhaust port. The compression release will be set in the "OFF" position. With the valves released, the engine crankshaft will be rotated with the starting motor until all pistons have completed a full 1cycle. The preservation cycle will then be repeated, after which the crankshaft will not be rotated The exhaust manifolds and intake manifolds will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods, and the inside of the rocker arm covers will be atomized sprayed with preservative lubricating oil as specified. The rocker arm covers will be blocked open in place with spacers ¼ to ½ inch to permit circulation of dry air over the rocker arm mechanism. If wood or metal spacers dissimilar to the block or cover are used, they will be insulated at point of contact with barrier material conforming to MIL-B-121, grade A. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start controls.

2. Engines without compression release start feature. The combustion chambers and valves will be preserved as specified in *e*(1) above.

Exception: Due to the tendency of the engine to fire and run on the preservative lubricating oil, the crankshaft will be rocked with the starting motor in lieu of continuous rotation.

The engine will be tagged as specified in *1* above.

(c) *Two cycle engines.*

1. Engines with intake ports and valves. The fuel throttle will be completely closed. The air box covers on the side of the engine opposite the blower will be removed. The exhaust manifolds and the rocker arm covers will be removed. The engine crankshaft will be rotated with the starting motor until the piston in the cylinder to be sprayed is below the intake port.

The spray nozzle will be inserted into the open port. Maximum air pressure will not exceed approximately 25 psi. One half of the determined amount (*a* above) of P-10 preservative lubricating oil, type I or II, grade 10, will be sprayed into the open port. The preservation cycle will be performed on each cylinder until all cylinders have been atomized sprayed with the preservative lubrication oil, after which the crankshaft will not be rotated. With each exhaust valve manually depressed, the remaining one half of the determined amount of preservative lubricating oil, will be atomized sprayed through each open exhaust valve port. The interior of the air box covers will be coated with preservative lubricating oil as specified. The air box covers will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The exhaust manifolds will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods, and the inside of the rocker arm covers will be atomized sprayed with preservative lubricating oil as specified. The rocker arm covers will be blocked open in place with spacers ¼ to ½ inch to permit circulation of dry air over the rocker arm mechanism. It wood or metal spacers dissimilar to the block or cover are used, they will be insulated at point of contact with barrier material conforming to MIL-B-121, grade A. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO USER". The tag will be attached near the engines start control.

2. *Engines without valves.* The fuel throttle will be completely closed. The exhaust manifolds will be removed. The engine crankshaft will be rotated until the piston in the cylinder to be sprayed is below the exhaust port. The spray nozzle will be inserted into the open exhaust port. Maximum air pressure will not exceed approximately 25 psi. One half of the determined amount (*a* above) of P-10, preservative lubricating oil, type I or II, grade 10 will be atomized sprayed through the open exhaust port. The crankshaft will be rotated until each cylinder has been sprayed through its open exhaust port. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The exhaust manifolds will be reinstalled using new gaskets, if the ones originally used shown evidence of damage. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control.

65. Air Cleaners. *a. Oil Bath Type.* Oil bath type air cleaners will be drained and fogged with type P-10, type I or II, grade 10 or 30 preservative oil.

b. Dry Type. Dry type air cleaners will be cleaned and dried. Contaminated non-mettalic and felt type elements will be replaced.

66. Governors. *a. Hydraulic Type.* Hydraulic systems will be filled to operating level with approved operating fluid.

b. Wet Type Mechanical. Prior to engine preservation, wet type mechanical governors having separate lubricating systems will be filled to operating level with P-10, preservative lubricating oil, type I or II, grade 30.

c. Dry Type Mechanical. No preservation required.

67. Reduction Gears. *a. Hydraulic Type.* Prior to engine preservation, the hydraulic reduction gear systems will be inspected for proper fluid level and contamination. Add approved fluid to bring to operating level or if contaminated drain and flush with operating fluid. Cleaned systems will be filled to operating level with approved fluid and operated during the preservation cycle of the engine. Any exposed exterior ferrous surfaces of the hydraulic systems will be coated with P-10 preservative lubricating oil type I or II, grade 30.

b. Mechanical Type. Mechanical reduction gears having separate lubricating systems will be inspected for level of lubricant and for evidence of water and contamination of lubricant. Add lubricant specified by the applicable lubrication order to raise existing lubricant to operating level or if contaminated, drain the lubricant, flush the gear housing with type P-3 preservative. Agitate with dry compressed air and thoroughly drain. The cleaned gear case will be filled to operating level with approved lubricant and operated under no load to insure coating of all interior surfaces and components. If impracticable to operate, agitate the lubricant with dry compressed air sufficiently to insure coverage of gears and internal parts of the housing. The flexible tubing employed for air agitation will be of a smaller diameter than the opening of the housing so that pressure will be released simultaneously with the agitation process.

68. Inclosed Gears. Oil lubricated gears not otherwise provided for will be inspected for level or lubricant and for evidence of water and contamination of lubricant. Add lubricant specified by the applicable lubrication order to raise existing lubricant to operating level or if contaminated, drain the lubricant, flush the gear housing with type P-3 preservative. Agitate with dry compressed air and thoroughly drain. The cleaned gear case will be filled to operating level with approved lubricant and operated under no load to insure coating of all interior surfaces and components. If impracticable to operate, agitate the lubricant with dry compressed air sufficiently to insure coverage of gears and internal parts of the housing. The flexible tubing employed for air agitation will be of a smaller diameter than the opening of the housing so that pressure will be released simultaneously with the agitation process.

69. Exposed Gears. Non-precision exposed gears will be coated with type P-2 preservative.

70. Drive Belts and Pulleys. The tension of all drive belts will be released. Pulley grooves will be coated with a thin film of rust inhibiting lacquer resisting synthetic primer comforming to FED-TT-P-664.

71. Exposed Drive Chains. Exposed drive chains will be coated with type P-3 preservative. Sufficient time will be allowed for excess preservative to drain from the chain. After draining the chain will be coated with type P-11 preservative.

72. Clutches and Related Components. *a. Dry Disc Type.* No preservation required.

b. Band and Shoe Type. No preservation required.

c. Cone Type. No preservation required.

d. Jaw Type. No preservation required.

e. Clutch Air Cylinder. The exposed surfaces of the piston rod will be coated with P-10 preservative lubricating oil, type I or II, grade 30.

f. Hydraulic Clutch Control. Where the clutch is operated by a hydraulic system, the hydraulic housing will be filled to operating level with approved operating fluid. The exposed surfaces of the piston rod will be coated with P-10 preservative lubricating oil type I or II, grade 30.

73. Brakes. The brake disc and/or drum facings and control mechanism will be coated with a thin film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-664. Care will be exercised to prevent primer from coming in contact with the brake lining and rubber impregnated parts.

74. Air Compressors. The operating lubricant will be drained and compressor crankcase refilled with P-10, preservative lubricating oil, type I or II, grade 30. The air line will be disconnected from the compressor. The air cleaner will be removed and while the compressor is being operated, 4 or 5 ounces of P-10 preservative lubricating oil, type I or II, grade 30, will be sprayed into the air intake. The compressor will be operated a sufficient length of time to assure coverage of all internal surfaces. The air cleaner and line will be reinstalled.

75. Tanks. *a. Gasoline, Diesel, Oil and Air Tanks.* Gasoline, diesel, oil and air tanks will be drained, cleaned and thoroughly dried. Filler cap and drain plugs will be bagged, identified and secured to the tank. All valves will be opened to allow circulation of air. Main diesel, gasoline or fuel oil tanks which are not located within the D. H. inclosure shall be preserved as specified for fuel tanks in paragraph 40, Chapter 4. Main fuel tanks preserved in the manner prescribed shall be vented as specified herein for other void spaces.

b. Water Tanks. Raw water tanks will be flushed with fresh water. All water tanks will be thoroughly dried. Contact preservatives will not be required, but ventilation will be provided.

76. Pumps (Other Than Engine Mounted). *a. Raw Water Pumps.* Raw water pumps will be flushed with fresh water and dried with clean dry compressed air. The pumps will be flushed with type P-3 preservative. The preservative will be drained and the drain plug coated with the preservative and reinstalled.

b. Potable Water Pumps. Potable water pumps will be drained and dried with clean dry compressed air. Coat the interior surfaces of the potable water pumps with type P-14 preservative. Pumps will be left open as much as possible to permit ventilation. Removed drain plugs will be bagged, identified and secured to the pump.

c. Fuel and Oil Pumps. Fuel and oil pumps will be drained and dried. The pumps will be completely filled with P-10 preservative lubricating oil, type I or II, grade 30 and then drained. Removed drain plugs will be bagged, identified and secured to the pump.

d. Pump Packing and Exterior Surfaces. All pump packings, except fuel and oil pumps, will be removed, bagged, identified and secured to the pump. Exterior unpainted ferrous surfaces such as drive shafts, couplings and packing glands will be coated with type P-2 preservative except water pumps. Shafts, couplings and packing glands of water pumps will be coated with type P-14 preservative.

77. Oil Purifiers and Filters. Oil purifying and filtering equipment will be drained. Oil sides will be cleaned with petroleum solvent, dried and coated with P-10 preservative lubricating oil, type I or II, grade 30. Permanent metallic scraper type filters will be cleaned, as specified above, dried and coated with the preservative.

78. Heat Exchanger. Raw water sides will be flushed with clean fresh water. Exchangers will remain open as much as feasible to permit ventilation. When possible end covers will be stowed in the offset position. Surfaces normally in contact with oil such as oil sides of oil coolers will be drained.

79. Refrigerating Units. Refrigerant will be pumped into reservoirs, leaving sufficient pressure in the system to prevent the entry of air. Sealed systems will not be disturbed. No preservation will be applied to the interior surfaces of refrigerant systems including refrigerant compressor. Interior compartments of walk-in coolers, reefer sections, and cold storage compartments will not be cleaned or preserved with any toxic type preservatives. Unprotected, bare ferrous metal surfaces, requiring a contactpreservative, will be coated with Type P-14 preservative conforming to MIL-P-116, or Phenolic primer conforming to MIL-P-12742, Type I. Wood surfaces within the cooler or cold storage compartments, requiring a preservative, will be coated with Phenolic primer conforming to MIL-P-12742, Type II. The compressor crankcase will be filled to operating level with approved operating lubricant. All bare exterior ferrous metal surfaces of the compressor will be caoted with P-10 preservative lubricating oil, Type I or II grade 30.

80. Electrical Equipment. *a. Rotating Electrical Equipment.* Explosion proof motors and motors and generators specially constructed for marine use can endure a lengthy exposure to humidity without deterioration. Ferrous metal slip rings will be coated with P-10 preservative lubricating oil, type I or II, grade 30.

b. Switchboards, Panels and Controllers. No preservation required.

c. Receptacles. Receptacles exposed to the weather will be sealed against entrance of water by applying waterproof pressure sensitive tape between the receptacle and its cover. Receptacles in compartments will not be sealed.

d. Gages and Instruments. Gages and instruments will be cleaned using the most applicable process of MIL-P-116. No preservative materials will be applied to gages and instruments.

e. Horns, Bells, Buzzers, Navigational and Floodlights. All external mounted, horns, bells, buzzers, navigational and floodlights provided with a waterproof protection will remain mounted. Units not provided with waterproof protection will be removed, identified and stowed in the dehumidified area. No preservation required.

81. Heating Boilers. The hot water heating boilers will be cleaned and thoroughly dried with dry compressed air. Drain plugs will be removed and lines disassembled sufficiently to effect complete draining of water. Fire sides of boilers will be cleaned. Lines disassembled for draining will be reinstalled. Boilers will be left open to provide circulation of air.

82. Oil Burners. Pot and atomizing type oil burners will be drained, cleaned and dried.

83. Valves. *a. Weather Exposed Valves.* Weather exposed valves will be turned to full open position, the stems will be coated with type P-2 preservative and the valves will then be closed. Unpainted ferrous metal surfaces remaining exposed will be coated with type P-1 preservative.

b. Sea Valves and Overboard Discharge Valves. Sea valves and overboard discharge valves will be secured in a closed position with wire to prevent accidental opening. Sea strainer baskets will be cleaned. The baskets will be left in place and strainer covers left in a closed position on wet stored vessels and in an open position on dry stored vessels.

c. Other Valves within Compartments. Packing gland nuts will be loosened and the valves will be left in an open position.

84. Capstans, Winches and Windlasses. The above deck portions of capstans, winches and windlasses such as exposed gears and pinions will be coated with type P-2 preservative. Gear boxes will be filled to operating level with P-10 preservative lubricating oil, type I or II, grade 30. The gears will be turned to insure distribution of the preservative throughout the assembly. If turning of the gears is not practical, the upper parts of the assembly will be preserved by atomized spraying with P-10, preservative lubricating oil, type I or II, grade 30, or by completely filling the gear box with the preservative and draining to operating level. Brake bands and drums will be preserved in accordance with paragraph 73. All exposed ferrous surfaces of shafts, linkages and threaded adjustment will be coated with type P-1 preservative. Shelters will be constructed and placed over the entire units in a manner to protect from entry of water but to permit ventilation. The shelters shall be painted as specified and shall incorporate the fabrication features as specified herein. Drive units for capstans, winches and windlasses, separate from the main drive unit of the vessel, will be preserved as specified for similar units.

85. Piping Systems. All water, fuel and oil piping systems will be drained. Raw water systems will be flushed with fresh water. All water systems, including sanitary systems, bilge and ballast, fire fighting, and hot water heating system, will be blown dry with dry compressed air. Openings and disconnections made for draining will be reassembled. Openings at the highest and lowest point of each piping system will be provided to permit ventilation.

86. Davits. Davits not removed from decks will be secured. Threaded unpainted surfaces will be coated with type P-11 preservative. Bearing surfaces and threads of removed davits will be coated with type P-11 preservative and the davit stowed under shelter.

87. Deck Fittings. Threaded surfaces of deck plates and plugs will be coated with type P-11 preservative and reinstalled. Recessed fittings will be coated with P-11 preservative and the recess sealed against entry of water using tape and strippable coating.

88. Davits, Staff and Stanchion Sockets and Bearings. Sockets and sleeve type bearings for the support of davits and similar type components will be coated with type P-11 preservative and sealed against the entry of water using caps, plugs or tape and strippable coating.

89. Anchors. Anchors easily lifted to the deck will be disconnected from the anchor chain and secured in an appropriate location on the deck. Spare anchors will be secured in the storage facilities provided. Any bare ferrous surfaces of the anchor or its fittings not normally painted will be protected with a coating of type P-1 preservative. Detached anchor chains will be stowed in the chain lockers.

90. Wire Rope, Riggings and Fittings. *a. Rigging.* Standing rigging and related fittings will be coated with lubricant conforming to type II, grade B, of FED-VV-L-751. Threaded fittings such as turnbuckles and shackles will be turned sufficiently to assure a coating of preservative on the mating threaded surfaces. Areas of turnbuckles fitted with protective cover will be coated with the lubricant. Riggings not required for support of masts and other components will be stowed in the dehumidified area.

b. Wire Rope on Drums or Reels. Wire rope on drums of winches and similar gear will be unwound and coated with lubricant conforming to type II, grade B of FED-VV-L-751. The exposed unpainted surfaces of the drum will be coated with the lubricant and the wire rope will be rewound on the drum. A shelter of wood or metal provided with adequate ventilation will be utilized in those instances where reels or drums cannot be stowed in sheltered areas. Wood shelters shall be painted as specified and shall incorporate the fabrication features as specified.

91. Steering Systems. Unpainted surfaces of quadrants, rods, linkages and fittings exposed to the weather will be coated with type P-1 preservative. Exposed cables will be coated with lubricant conforming to type II, grade B of FED-VV-L-751. Prior to preservation of hydraulic controlled steering system, rudders will be positioned in a manner that will retract actuating rods of hydraulic rams as far as possible. Exposed surfaces of rods will be coated with P-10 preservative lubricating oil, type I or II, grade 30. Electrical and geared components of steering systems will be preserved in accordance with the applicable instructions contained herein.

92. Machine Tools. All precision finished exterior surfaces of machine tools will be coated with type P-11 preservative. Movable parts will be moved during application of the preservative to insure complete coating of mating surfaces. All close fitting machined surfaces will be coated with P-10 preservative lubricating oil, type I or II, grade 30. Oil lubricated gear cases will be atomized sprayed with P-10, preservative lubricating oil, type I or II, grade 30. Hydraulic systems will be filled to operating level with approved hydraulic fluid.

93. Galley Equipment. Type P-14 preservative will be applied only to those surfaces of galley equipment vulnerable to corrosion. Refrigerators and ranges will be cleaned using the most applicable process of MIL-P-116 and will be opened to ventilation. Oil burners of galley ranges will be drained.

94. Seat Cushions and Backs. No preservation required.

95. Sanitary Facilities. Ferrous metal lavatory, showers and toilet piping not connected to a potable water system will be flushed with clean fresh water and then drained and blown dry with dry compressed air. Disassembled lines, traps and drain plugs removed to facilitate draining will be reinstalled.

96. Fixed Fire Fighting System. Release mechanism of the system will be wired to prevent accidental discharge. No preservation required.

97. Unprotected Exposed Metal Surfaces and Linkages. *a. Precision.* Coat unprotected ferrous metal precision machined surfaces and linkages with type P-6 or P-11 preservative compound.

b. Non-precision. Coat unprotected ferrous metal non-precision surfaces and linkages with type P-1 preservative.

97.1 Thru Hull Fittings/Sea Connections. Thru hull fittings/sea connections for dry stored vessels will be preserved as follows:

a. Interior surfaces of thru hull fittings/sea connections shall be cleaned and free of dirt, rust, scale, and other foreign matter. Cleaned surfaces shall be preserved with type P-2 or P-3 preservative.

b. The thru hull fittings/sea connections at the hull exterior will be masked with pressure-sensitive tape, conforming to PPP-T-60, Type IV and coated with strippable and bituminous coating. The strippable and bituminous coating shall extend beyond the edges of the tape. A solid wood plug or blank may be used in place of the tape at the discretion of the storing activity.

97.2 Door Hinges and Dogs. Door hinges, fasteners and dog bearings shall be thoroughly coated with type P-2 preservative and the excess wiped away.

Section III. PRESERVATION WITH DYNAMIC DEHUMIDIFICATION WITH COCOON)

98. General. This section contains instructions for preservation with dynamic dehumidification and cocooning. This method of dynamic dehumidification will be accomplished by constructing a cocoon and installing dehumidification equipment as outlined in paragraphs 142 through 151.

99. Engines. *a. Combustion Chambers.* When preservation of combustion chambers is specified, the amount of preservative lubricating oil to be applied to each cylinder will be as follows:

(1) One half ounce for each cylinder with piston displacement up to 25 cubic inches.

(2) One ounce for each cylinder with piston displacement between 25 and 50 cubic inches.

(3) One and one-half ounces for each cylinder with piston displacement between 50 and 75 cubic inches.

(4) Two ounces for each cylinder with piston displacement over 75 cubic inches.

CAUTION

> Precautions will be taken to assure that the amount of oil injected into the combustion chambers and manifolds will not result in hydrostatic lockup on the engine. Prior to preserving additional engines, the first engine preserved will be allowed to stand idle for 12 hours. The engine crankshaft will then be rotated manually, or by the starting motor if manual rotation is not possible, to assure that the amount of oil injected into the combustion chambers and manifolds permits free rotation of the engine.

b. Crankcases. Prior to preservation of the fuel system and combustion chambers, the engine crankcase and the crankcase of engine accessories will be preserved as follows:

(1) *Wet sump.*

(a) Spark-ignition engines and compression-ignition engines operating at output level up to 150 psi, brake mean effective pressure (BMEP). At the beginning of engine preservation, the engine crankcase, and the crankcases of any mounted accessories having a separate crankcase from the engine, will be filled to the operating level with P-10, preservative lubricating oil, type I, grade 10, 30, or 50, as applicable. Upon completion of engine preservation, the preservative oil will remain in the crankcases. A tag will be prepared for each crankcase indicating: "THIS CRANKCASE IF FILLED TO THE OPERATING LEVEL WITH PRESERVATIVE LUBRICATING OIL GOOD FOR OPERATION UNTIL THE FIRST REQUIRED LUBRICANT CHANGE — DO NOT DRAIN — CHECK OIL LEVEL — IF LOW FILL TO THE OPERATING LEVEL WITH THE OPERATING OIL (MIL-L-2104) APPLICABLE GRADE." The tags will be attached to the crankcase fill tubes.

(b) Compression-ignition engines operating at output levels of 150 psi (BMEP) and above. At the beginning of engine preservation, the engine crankcase, and the crankcases of any mounted accessories having a separate crankcase from the engine, will be filled to the operating level with P-10 preservative lubricating oil, type II, grade 10 or 30, as applicable. Upon completion of engine preservation, the preservative oil will remain in the crankcases. A tag will be prepared for each crankcase indicating: "THIS CRANKCASE IS FILLED TO THE OPERATING LEVEL WITH PRESERVATIVE LUBRICATING OIL GOOD FOR OPERATION UNTIL THE FIRST REQUIRED LUBRICANT CHANGE — DO NOT DRAIN — CHECK OIL LEVEL — IF LOW FILL TO THE OPERATING LEVEL WITH THE

OPERATING OIL (MIL-L-2104) APPLICABLE GRADE." The tag will be attached to the crankcase fill tubes.

(2) *Dry sump.*

(a) Crankcase of air-cooled engines that are lubricated by adding lubricating oil to the fuel, P-10, preservative lubricating oil, type I, grade 10, 30 or 50, as applicable, will be added to the fuel in the ratio specified for normal operation. The engine will be started and operated at fast

idle until running smoothly. The engine will then be accelerated to 3/4 speed, without load, to assure coverage of all interior surfaces of the lubricating system.

(b) Air-cooled dry sump engines which operate with no oil in the crankcase, the inspection plate, air box cover or the plugs from the bottom of the crankcase will be removed and the entire interior of the crankcase will be sprayed with P-10 preservative lubricating oil, type I, grade 30, while rotating the engine crankshaft at least three complete revolutions.

c. Cooling System.

(1) *Fresh water systems.* Fresh water systems will be drained. Systems rusty or otherwise contaminated will be cleaned using cleaning compound conforming to MIL-C-10597. Cleaned systems will be blown dry with dry compressed air. Filler caps and drain plugs will be left open to provide ventilation. Removed caps and plugs will be bagged, identified and secured on or near the point of use.

(2) *Raw water systems.* Raw water systems will be flushed with clean fresh water and blown dry with dry compressed air. Circulation of air through the system will be provided by removal of filler caps, drain plugs and open valves. Extensive disassembly of piping will not be accomplished to provide ventilation.

d. Fuel Systems.

(1) *Spark-ignition gasoline engines.*

(a) *Engines with carburetors.* A portable container with two compartments will be positioned to provide gravity feed to the engine. One compartment will contain gasoline and the other compartment will contain type P-9 preservative oil. The engines fuel supply line will be disconnected at the most convenient point. A flexible line from the portable container will be connected to the fuel supply line leading to the engine. The container selector valve will be turned to the gasoline position. The engine will be started and operated at fast idle until running smoothly, then accelerated to 3/4 speed without load. At the same time the fuel supply selector valve will be switched to the preservative oil position. The instant the oil reaches the combustion chambers (evidenced by loss of speed, misfiring, and excessive smoking) the ignition will be turned off. After the engine has stopped, the line from the portable container will be disconnected from the engine tuel supply line. The engine fuel supply line will be reconnected. Fuel filters and sediment bowls will be drained.

(b) *Engines with fuel injectors.* The injector fuel return coupling will be disconnected. A line will be connected to the injector fuel return coupling on the engine to permit draining into a recovery container. The fuel system will then be preserved as specified in (*a*) above. (The recovered fuel and oil mixture will not be used to preserve other fuel systems.)

(2) *Compression-ignition (diesel and multifuel) engines (2 and 4 cycle).*

(a) *Gasoline starting engines.* A portable container with two compartments will be positioned to provide gravity feed to the engine. One compartment will contain gasoline and the other compartment will contain type P-9 preservative oil. The flexible line from the portable container will beconnected to the engine fuel pump intake line.The engine fuel return line will be disconnected at the quick-disconnect coupling. A transparent plastic line will be connected to the disconnected engine fuel return line, and the other end will be inserted into a recovery container to collect the returned fuel. Another portable container will be provided and will contain type P-9 preservative oil. The diesel or multifuel engine fuel supply line will be disconnected at the most convenient point nearest the fuel pump. The line from the portable container will be connected to the fuel-to-engine line at the point of disconnect. Controls will be positioned for gasoline operation. The three-way valve of the two compartment container will be turned to the gasoline "ON" position. The engine will be started and operated until running smoothly. The engine speed will then be increased to 3/4 speed and the container selector valve turned to the preservative oil "ON" position. Engine will be operated until it begins to misfire, and the engine controls will immediately be switched to diesel or multifuel operation. The engine will be operated at 1/2 speed until undiluted preservative oil is flowing into the recovery container. The engine will then be increased to 3/4 speed for approximately 15 seconds and the engine then turned off. Portable container valves will be turned to "OFF" position and the lines disconnected from the engine fuel intake lines. The engine fuel intake lines will be reconnected. The temporary fuel return line will be disconnected and the permanent fuel return line reconnected. Fuel filters and sediment bowls will be drained. (The recovered fuel oil mixture will not be used to preserve other fuel systems).

(b) *Straight diesel and multifuel engines.* The engine fuel intake line will be disconnected at the most convenient accessible point nearest the fuel supply tank. A line from a portable container containing fuel conforming to VV-F-800 will be connected to the fuel intake line leading to the engine. The injector fuel return line will be disconnected at the disconnect coupling. A transparent line will be connected to the injector fuel return coupling to allow for draining into a recovery container. The fuel valve of the portable container will be turned to the "ON" position. The engine will be started and operated at fast idle until thoroughly warm. The engine will then be accelerated to 3/4 speed, at which time the fuel supply will be switched to the portable container containing type P-9 preservative oil. The engine will be operated at this speed until undiluted preservative oil is flowing into the recovery container. The engine will then be stopped. The temporary fuel return line will be disconnected and the permanent fuel return line reconnected. The temporary fuel intake line will be disconnected and the permanent fuel intake line reconnected. Fuel filters and sediment bowls will be drained. (The recovered fuel oil mixture will not be used to preserve the fuel systems).

(c) *Gasoline starting auxiliary (pony) engines.* After the attached diesel or multifuel engine has been preserved, the gasoline engines will be disengaged from the diesel or multifuel engine. The gasoline engine fuel system, combustion chambers, and valves will then be preserved as specified for spark-ignition engines.

e. Combustion chambers and valves.

(1) *Spark-ignition engines.* After completion of the fuel system preservation, the engine will be allowed to cool to a cylinder head temperature of maximum 100 °F, measured at the spark plug area of all cylinders. Cooling may be accelerated by induced air currents. After the engine has cooled, the spark plugs will be removed. Care will be exercised to avoid damage to the threads, electrodes, and gaskets. While cranking the engine with the starting motor, one-half of the determined amount (*a* above) of P-10 preservative lubricating oil, type I, grade 30 will be atomized sprayed into each cylinder through each spark plug opening. The nozzle will be inserted into the combustion chamber and maximum air pressure for spraying will not exceed 25 psi. Without cranking the engine, the additional one-half of the determined amount of the preservative lubricating oil specified will be atomized sprayed into each cylinder through each spark plug opening, after which the crankshaft will not be rotated. The spark plug threads will be coated with the preservative lubricating oil as specified. The spark plugs will be reinstalled. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control switch.

(2) *Compression-ignition engines (diesel and multifuel).* After the engines have cooled to a cylinder head temperature of 100 °F or less, measured at the injector nozzle flange area surfaces of each cylinder, the combustion chambers and valves of compression-ignition engines will be preserved as follows.

(a) *Four cycle spark ignition (gasoline) starting engines.* The intake manifolds, the exhaust manifolds, and the rocker arm covers will be removed. The engine controls will be set for gasoline operation. The diesel or multifuel throttle will be completely closed. The spark plug wires will be disconnected. Each intake valve will be manually depressed, and while each valve is held open, one-fourth of the determined amount (*a* above) of P-10 preservative lubricating oil, type I or II, grade 10 will be atomized sprayed into each cylinder through the intake ports. The nozzle tip will be inserted into the port. The maximum air pressure for spraying will not exceed approximately 25 psi. Each exhaust valve will then be manually depressed; and while each valve is held open, one-fourth of the determined amount of the same type and grade of preservative lubricating oil specified will be atomized sprayed through each open exhaust port into each cylinder. In addition to the determined amount, 1/4 ounce of the preservative lubricating oil specified will be atomized sprayed into each starting valve port. With the valves released, the engine crankshaft will then be rotated until all pistons have completed a full cycle. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The spark plugs will be removed. Care will be exercised to prevent damage to the threads, electrodes, and gaskets. The spark plug threads will be coated with the preservative lubricating oil specified herein. The spark plugs will be reinstalled. The exhaust manifolds and intake manifolds will be reinstalled using new gaskets if the one originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods, and the inside of the rocker arm covers will be sprayed with the preservative lubricating oil specified. The rocker arm covers will be blocked open in place with spacers, 1/4 to 1/2 inch to permit circulation of dry air over the rocker arm mechanism. If wood or metal spacers dissimilar to the block or cover are used, they will be insulated at point of contact with barrier material conforming to MIL-B-121, grade A. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start controls.

(b) *Four cycle, straight diesel or multifuel engines.*

1. Engines with compression release start feature. The intake manifolds, the exhaust manifolds and the rocker arm covers will be removed. The fuel throttle will be completely closed. Each intake valve will be manually depressed; and while each valve is held open, one fourth of the determined amount (*a* above) of P-10 preservative lubricating oil, type I or II, grade 10, will be atomized sprayed into each cylinder through each open intake port. The nozzle tip will be inserted into the open port. The maximum air pressure for spraying will not exceed approximately 25 psi. Each exhaust valve will then be manually depressed; and while each valve is held open fourth of the determined amount of the preservative lubricating oil will be atomized sprayed into each cylinder through each open exhaust port. The compression release will be set in the "OFF" position. With the valves released, the engine crankshaft will be rotated with the starting motor until all piston have completed a full cycle. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The exhaust manifolds and intake manifolds will be reinstalled using new gaskets if the ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valves stems, push rods, and the inside of the rocker arm covers will be atomized sprayed with preservative lubricating oil specified herein. The rocker arm covers will be blocked open in place with spacers 1/4 to 1/2 inch to permit circulation of dry air over the rocker arm mechanism. If wood or metal spacers dissimilar to the block or cover are used, they will be insulated at point of contact with barrier material conforming to MIL-B-121, grade A. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start controls.

2. Engines without compression release start feature. The combustion chambers and valves will be preserved as specified in *1.* above. *EXCEPTION:* **Due to the tendency of the engine to fire and run on the preservative lubricating oil, the crankshaft will be rocked with the starting motor in lieu of continuous rotation.**

The engine will be tagged as specified in *1.* above.

(c) *Two cycle engines.*

1. Engines with intake ports and valves. The fuel throttle will be completely closed. The air box covers on the side of the engine opposite the blower will be removed. The exhaust manifolds and the rocker arm covers will be removed. The engine crankshaft will be rotated with the starting motor until the piston in the cylinder to be sprayed is below the intake port. The spray nozzle will be inserted into the open port. Maximum air pressure will not exceed approximately 25 psi. One half of the determined amount (*a* above) of P-10 preservative lubricating oil, type I or II, grade 10, will be sprayed into the open port. The preservation cycle will be performed on each cylinder until all cylinders have been atomized sprayed with the preservative lubricating oil, after which the crankshaft will not be rotated. With each exhaust valve manually depressed, the remaining one half of the determined amount of preservative lubricating oil will be atomized sprayed through each open exhaust valve port. The interior of the air box covers will be coated with preservative lubricating oil as specified. The air box covers will be reinstalled using new gaskets if the ones originally used show evidence of damage. The exhaust manifolds will be reinstalled using new gaskets, if the ones originally used show evidence of damage. The rocker arm assemblies, springs, guides, valve stems, push rods, and the inside of the rocker arm covers will be atomized sprayed with preservative lubricating oil as specified. The rocker arm covers will be blocked open in place with spacers 1/4 to 1/2 inch to permit the circulation of dry air over the rocker arm mechanism. If wood or metal spacers dissimilar to the block or cover are used, they will be insulated at point of contact with barrier material conforming tc MIL-B-121, grade A. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control.

2. Engines without valves. The fuel throttle will be completely closed. The exhaust manifolds will be removed. The engine crankshaft will be rotated until the piston in the cylinder to be sprayed is below the exhaust port. The spray nozzle will be inserted into the open exhaust port Maximum air pressure will not exceed approximately 25 psi. One-half of the determined amount (*a* above) of P-10, preservative lubricating oil, type I or II, grade 10, will be atomized sprayed through the open exhaust port. The crankshaft will be rotated until each cylinder has been sprayed through its open exhaust port. The preservation cycle will then be repeated, after which the crankshaft will not be rotated. The exhaust manifolds will be reinstalled using new gaskets if the ones originally used show evidence of damage. A tag will be prepared indicating: "ENGINE PRESERVED—DO NOT CRANK UNTIL ISSUED TO THE USER". The tag will be attached near the engine start control.

100. **Air Cleaners.** *a. Oil Bath Type.* Oil bath type air cleaners will be drained, cleaned and fogged with type P-10, type I or II, grade 10 or 30 preservative oil and reinstalled.

b. Dry Type. Dry type air cleaners will be cleaned and dried. Contaminated nonmetallic and felt type elements will be replaced.

101. **Governors.** *a. Hydraulic Type.* Hydraulic systems will be filled to operating level with approved operating fluid.

b. Wet Type Mechanical. Prior to engine preservation, wet type mechanical governors having separate lubricating systems will be filled to operating level with P-10 preservative lubricating oil, type I or II, grade 30.

c. Dry Type Mechanical. No preservation required.

102. **Reduction Gears.** *a. Hydraulic Type.* Prior to engine preservation, the hydraulic reduction gear systems will be inspected for proper fluid level and contamination. Add approved fluid to bring to operating level; or if contaminated, drain and flush with operating fluid. Cleaned systems will be filled to operating level with approved fluid and operated during the preservation cycle of the engine. Any exposed exterior ferrous surfaces of the hydraulic systems will be coated with P-10 preservative lubricating oil, type I or II, grade 30.

b. Mechanical Type. Mechanical reduction gears having separate lubricating systems will be inspected for level of lubricant and for evidence of water and contamination of lubricant. Add lubricant specified by the applicable lubrication order to raise existing lubricant to operating level; or if contaminated, drain the lubricant and flush the gear housing with type P-3 preservative. Agitate with dry compressed air and thoroughly drain. The cleaned gear case will be filled to operating level with approved lubricant and operated under no load to insure coating of all interior surfaces and components. If impracticable to operate, agitate the lubricant with dry compressed air sufficiently to insure coverage of gears and internal parts of the housing. The flexible tubing employed for air agitation will be of a smaller diameter than the opening of the housing so that pressure will be released simultaneously with the agitation process.

103. **Inclosed Gears.** Oil lubricated gears not otherwise provided for will be inspected for level of lubricant and for evidence of water and contamination of lubricant. Add lubricant specified by the applicable lubrication order to raise existing lubricant to operating level; or if contaminated, drain the lubricant and flush the gear housing with type P-3 preservative. Agitate with dry compressed air and thoroughly drain. The cleaned gear case will be filled to operating level with approved lubricant and operated under no load to insure coating of all interior surfaces and components. If impracticable to operate, agitate the lubricant with dry compressed air sufficiently to insure coverage of gears and internal parts of the housing. The flexible tubing employed for air agitation will be of a smaller diameter than the opening of the housing so that pressure will be released simultaneously with the agitation process.

104. **Exposed Gears.** Nonprecision exposed gears will be closed with P-2 preservative.

105. **Drive Belts and Pulleys.** The tension of all drive belts will be released. Pulley groves will be coated with a thin film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664.

106. **Exposed Drive Chains.** Exposed drive chains will be coated with type P-3 preservative. Sufficient time will be allowed for excess preservative to drain from the chain. After draining the chain will be coated with type P-11 preservative.

107. **Clutches and Related Components.** *a. Dry Disc Type.* No preservation required.

b. Band and Shoe Type. No preservation required.

c. Cone Type. No preservation required.

d. Jaw Type. No preservation required.

e. Clutch Air Cylinder. The exposed surfaces of the piston rod will be coated with P-10 preservative lubricating oil, type I or II, grade 30.

f. Hydraulic Clutch Control. Where the clutch is operated by a hydraulic system, the hydraulic housing will be filled to operating level with approved operating fluid. The exposed surfaces of the piston rod will be coated with P-10 preservative lubricating oil, type I or II, grade 30.

108. **Brakes.** The brake disc and/or drum facings and control mechanism will be coated with a thin

film of rust inhibiting lacquer-resisting synthetic primer conforming to FED-TT-P-664. Care will be exercised to prevent primer from coming in contact with the brake lining and rubber impregnated parts.

109. Air Compressors. The operating lubricant will be drained from the compressor crankcase and the crankcase refilled with P-10 preservative lubricating oil, type I or II, grade 30. The air line will be disconnected from the compressor. The air cleaner will be removed; and while the compressor is being operated, 4 or 5 ounces of P-10 preservative lubricating oil, type I or II, grade 30, will be sprayed into the air intake. The compressor will be operated a sufficient length of time to assure coverage of all internal surfaces. The air cleaner and line will be reinstalled.

110. Tanks. *a. Gasoline, Diesel, Oil and Air Tanks.* Gasoline, diesel, oil, and air tanks will be drained, cleaned and thoroughly dried. Filler cap and drain plugs will be bagged, identified and secured on or near the point of use. All valves will be opened to allow circulation of air.

b. Water Tanks. Raw water tanks will be flushed with fresh water. All water tanks will be thoroughly dried. Contact preservatives will not be required, but ventilation will be provided.

111. Pumps (Other Than Engine Mounted). *a. Raw Water Pumps.* Raw water pumps will be flushed with fresh water and dried with clean dry compressed air. The pumps will be flushed with type P-3 preservative. The preservative will be drained and the drain plug coated with the preservative and reinstalled.

b. Potable Water Pumps. Potable water pumps will be drained and dried with clean dry compressed air. Coat the interior surfaces of the potable water pumps with type P-14 preservative. Pumps will be left open as much as possible to permit ventilation. Removed drain plugs will be bagged, identified and secured to the pump.

c. Fuel and Oil Pumps. Fuel and oil pumps will be drained and dried. The pumps will be completely filled with P-10 preservative lubricating oil, type I or II, grade 30. The preservative will be drained, and removed drain plugs will be bagged, identified and secured to the pump.

d. Pump Packing and Exterior Surfaces. All pump packings, except fuel and oil pumps, will be removed, bagged, identified and secured to the pump. Exterior unpainted ferrous surfaces such as drive shafts, coupling and packing glands of water pumps will be coated with type P-2 preservative, except water pumps. Shafts, couplings and packing glands will be coated with type P-14 preservative.

112. Oil Purifiers and Filters of Water Pumps. Oil purifying and filtering equipment will be drained. Oil sides will be cleaned with petroleum solvent, dried and coated with P-10 preservative lubricating oil, type I or II, grade 30. Permanent metallic scraper type filters will be cleaned as specified above, dried and coated with the preservative.

113. Heat Exchanger. Raw water sides will be flushed with clean fresh water. Exchangers will remain open as much as feasible to permit ventilation. When possible, end covers will be stowed in the offset position. Surfaces normally in contact with oil, such as oil sides of oil coolers, will be drained.

114. Refrigerating Units. Refrigerant will be pumped into reservoirs, leaving sufficient pressure in the system to prevent the entry of air. Sealed systems will not be disturbed. No preservation will be applied to the interior surfaces of refrigerant systems including refrigerant compressor. Interior compartments of walk-in coolers, reefer sections, and cold storage compartments will not be cleaned or preserved with any toxic type preservatives. Unprotected, bare ferrous metal surfaces, requiring a contactpreservative, will be coated with Type P-14 preservative conforming to MIL-P-116, or Phenolic primer conforming to MIL-P-12742, Type I. Wood surfaces within the cooler or cold storage compartments, requiring a preservative, will be coated with Phenolic primer conforming to MIL-P-12742, Type II. The compressor crankcase will be filled to operating level with approved operating lubricant. All bare exterior ferrous metal surfaces of the compressor will be coated with P-10 preservative lubricating oil, Type I or II garde 30.

115. Electrical Equipment. *a. Rotating Electrical Equipment.* Explosion-proof motors and generators specially constructed for marine use can endure a lengthy exposure to humidity without deterioration. Ferrous metal slip rings will be coated with P-10, preservative lubricating oil, type I or II, grade 30.

b. Switchboards, Panels and Controllers. No preservation required.

c. Receptacles. No preservation required.

d. Gages and Instruments. Gages and instruments will be cleaned using the most applicable process of MIL-P-116.

e. Horns, Bells, Buzzers, Navigational and Floodlights. Horns, bells, buzzers, navigational and floodlights will remain mounted. No preservation required.

116. Heating Boilers. The hot water heating boilers will be cleaned and thoroughly dried with dry compressed air. Drain plugs will be removed and lines disassembled sufficiently to effect complete draining of water. Fire sides of boilers will be cleaned. Lines disassembled for draining will be reinstalled. Boilers will be left open to provide circulation of air.

117. Oil Burners. Pot and atomizing type oil burners will be drained, cleaned and dried.

118. Valves. *a. Weather Exposed Valves.* Valves will be turned to the full open position and left open.

b. Sea Valves and Overboard Discharge Valves. Sea valves and overboard discharge valves will be secured in a closed position with wire to prevent accidental opening. Sea strainer baskets will be cleaned. The baskets will be left in place and strainer covers left in a closed position on wet stored vessels and in an open position on dry stored vessels.

c. Other Valves Within Compartments. Packing gland nuts will be loosened and the valves will be left in open position.

119. Capstans, Winches and Windlasses. No preservation required.

120. Piping Systems. All water, fuel and oil piping systems will be drained. Raw water systems will be flushed with fresh water. All water systems, including sanitary system, bilge and ballast, fire fighting, and hot water heating system, will be blown dry with dry compressed air. Openings and disconnections made for draining will be reassembled. Openings at the highest and lowest point of each piping system will be provided to permit ventilation.

121. Davits. No preservation required.

122. Deck Fittings. No preservation required.

123. Davits, Staff and Stanchion Sockets and Bearings. No preservation required.

124. Anchors. No preservation required.

125. Wire Rope, Riggings and Fittings. *a. Rigging.* Standing rigging and related fittings will be coated with lubricant conforming to type II, grade B of FED-VV-L-751. Threaded fittings such as turnbuckles and shackles will be turned sufficiently to assure a coating of preservative on the mating threaded surfaces. Areas of turnbuckles fitted with protective cover will be coated with the lubricant.

b. Wire Rope on Drums and Reels. Wire rope on drums of winches and similar gear will be unwound and coated with lubricant conforming to type II, grade B of FED-VV-L-751. The exposed unpainted surfaces of the drum will be coated with the lubricant and the wire rope will be rewound on the drum.

126. Steering Systems. No preservation required.

127. Machine Tools. All precision surfaces will be coated with type P-11 preservative. Movable parts will be moved during application of the preservative to insure complete coating of mating surfaces. All close fitting machined surfaces will be coated with P-10 preservative lubricating oil, type I or II, grade 30. Oil lubricating gear cases will be atomized sprayed with P-10 preservative lubricating oil, type I or II, grade 30. Hydraulic systems will be filled to operating level with approved hydraulic fluid.

128. Galley Equipment. Type P-14 preservative will be applied only to those surfaces vulnerable to corrosion. Refrigerators and stoves will be cleaned using the most applicable process of MIL-P-116 and will be opened for ventilation. Oil burners of galley ranges will be completely drained.

129. Seat Cushions and Backs. No preservation required.

130. Sanitary Facilities. Ferrous metal lavatory, shower and toilet piping not connected to a potable water system will be flushed with clean fresh water and then drained and blown dry with dry compressed air. Disassembled lines, traps and drain plugs removed to facilitate thorough draining will be reinstalled.

131. Fixed Fire Fighting System. Release mechanism of the system will be wired to prevent accidental discharge. No preservation required.

132. Unprotected Exposed Metal Surfaces and Linkages. *a. Precision.* Coat unprotected ferrous metal precision machined surfaces and linkages with type P-6 or P-11 preservative compound.

b. Non-Precision. Coat unpainted ferrous metal, non-precision surfaces and linkages with type P-1 preservative.

132.1. Thru Hull Fittings/Sea Connections. Thru hull fittings/sea connections for dry stored vessels will be preserved as follows:

a. Interior surfaces of thru hull fittings/sea connections shall be cleaned and free of dirt, rust, scale, and other foreign matter. Cleaned surfaces shall be preserved with type P-2 or P-3 preservative.

b. The thru hull fittings/sea connections at the hull exterior will be masked with pressure-sensitive tape, conforming to PPP-T-60, Type IV coated with strippable and bituminous coating. The strippable and bituminous coating shall extend beyond the edges of the tape. A solid wood plug or blank may be used in place of the tape at the discretion of the storing activity.

132.2. Door Hinges and Dogs. Door hinges, fasteners and dog bearings shall be thoroughly coated with type P-2 preservative and the excess wiped away.

CHAPTER 5

DEPRESERVATION INSTRUCTIONS

133. General. Depreservation of vessels includes any necessary removal of barrier-materials, sealing materials, desiccant, blanks, plugs and caps, dehumidification systems, sensing elements, shelters and ventilators. Also included are connection of all disconnected piping, insertion of drain plugs, installation of packings, reassembly of disassembled items, and closure of openings made for purpose of preservation.

134. Preservation and Depreservation Guide. A Preservation and Depreservation Guide for Marine Equipment (DA Form 3256) will be prepared in duplicate for each vessel at the time of preservation. One copy will be placed in a waterproof envelope marked "Preservation and Depreservation Guide" and securely attached in a conspicuous and protected location in the pilothouse. One copy will be placed in the vessel record file.

NOTE

The preservation and depreservation guide will be annotated to reflect the type and grade of lubricants specified herein.

135. Tagging. Warning and instruction tags will be used as a supplement to, but not as a substitute for, depreservation instructions. Tags will be attached to items or systems in conspicuous locations to draw attention to the need for any depreservation operation likely to be overlooked which would endanger personnel or equipment.

136. Removal of Preservatives. Removal of P-type preservatives, except P-14 when required, will be accomplished by use of solvent conforming to MIL-S-18718 or FED-TT-T-291, grade 1. Removal of P-14 preservative will be accomplished by use of soap and water, or with scouring powder, detergent, or other cleaner approved for galley use.

CHAPTER 6
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS

137. General. *a.* Dynamic dehumidification involves the use of a machine dehumidifier. The machine removes moisture from air circulated through it by means of built-in beds of desiccant. The machine periodically reactivates the desiccant by driving off accumulated moisture by heating.

b. General instructions for the installation of dynamic dehumidification systems on vessels being preserved for storage are provided in this chapter.

c. Detailed instructions for installation of a dynamic dehumidification system on each standard design vessel, as applicable, are provided in appendices B through V.

d. Dynamic dehumidification (D/H) drawings illustrated in the appendicies were developed for standard design vessels on a type/design basis. D/H system designs depicted herein may be changed or modified by the local storing activity when such changes are required due to vessel modifications.

e. Development of D/H system designs and installation is locally authorized for new design craft entering the inventory for which D/H design drawings have not been prepared.

f. When the D/H design configuration is changed or modified from that shown in the drawings illustrated in the appendicies, such changes shall be penciled in red on a reproduced copy of the drawing. A copy of this marked-up drawing along with supporting narrative instructions describing the changes will be maintained by the local storage facility storing the craft. A copy of the marked-up drawing including changes in narrative instructions will be forwarded to the publication preparing activity DRSTS-SDP.

138. Installation of Dynamic Dehumidication. *a. Dehumidification Machine.* There are two sizes of machines normally used for the dehumidification of floating equipment. The smaller machine, which has a nominal capacity of 10,000 cubic feet, will be used in most cases. The larger machine, which has a nominal capacity of 150,000 cubic feet, will be used primarily on large vessels such as floating repair shops and ocean going tugs Y-Tankers and liquid or dry vessels. When multiple 10,000 CFM dehumidication units are used to service one zone they may be wired through a relay box as shown in figure 1.

NOTE

> Multiple DH units wired through relay must be synchronized in order that no more than two (2) units go into the reactivation cycle at the same time. Failure to synchronize the units will result in blown fuses. A suitable cover will be fabricated as shown in figure 2 to provide protection for the relay box.

(1) *Location of machines.* The machines will be located outside the areas to be dehumidified, and will be situated to require a minimum of duct work. The machines will be protected from the weather by suitable shelters. At storage sites insulated to reflect solar heat. The desiccant beds cast off moisture within the machines when exposed to the excessively high temperature and lose their capacity to absorb moisture during the drying cycle if overheated at that time. Machine covers will be designed to encourage air circulation. Care will be taken not to obstruct the reactivation outlets of the machine. A short extension running outward and downward from one of the reactivation outlets will aid in the exchange of air required to reactivate the desiccant.

(2) *Ductwork and connections.* Air will be circulated between the dehumidification machine and the area to be dehumidified through galvanized sheet metal ducts. Four-inch diameter ducts will be used for the 10,000 cubic feet machine, and six inch diameter ducts with the larger machines. The ducts will be attached to the machines by the use of slip joints or couplings which permit easy removal of the machines for servicing or repair. Where flexibility is required, as in carrying air between wet stored vessels, lengths of hose conforming to MIL-H-8796 will be used. Maximum use will be made of existing openings for connecting the duct work to the area to be dehumidified. Suitable galvanized sheet metal or exterior grade plywood blanks will be used in introducing the air lines through airports, accesses and other openings. Holes will be made in bulkheads and other components of the vessels only when there is no other means of ingress. Normally, dry air will be introduced near the top of the area penetrated by the ductwork, with moist air being withdrawn from a point near the bottom of the area to be dehumidified. The dry air and moist air lines will be positioned to encourage circulation of air and to prevent short circuiting of the air between the two openings. In rare cases, booster blowers may be needed to provide satisfactory dehumidification. Complete circulation of air is not necessary; difference in vapor pressure tend to equalize humidity regardless of air flow.

b. Humidistats. The operation of each dehumidification machine will be controlled by a humidistat. The humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified zones. The humidistat will be installed within the dehumidified area approximately three feet above the compartment deck. It will be located well away from incoming dry air. Where a series of vessels or compartments are linked in a continuing cycle of air circulation, the humidistat will be located within the area from which the moist air is returned directly to the machines.

c. Sensing Elements. Humidity sensing elements of an approved type will be installed in dehumidified areas for inspection purposes. The number and location of sensing elements will vary with the configuration of the total area included in a single sealed zone. The number of elements used will be limited to the number required for a reasonable check on vapor diffusion within the zone. Sensing elements will be located near the points from which moist air is withdrawn. In no case will they be directly in the path of incoming dry air.

139. Sealing of Dynamic Dehumidification. *a. Requirements.* All openings to the zone to be dehumidified must be sealed in a manner to provide good resistance to the passage of water vapor. The sealing media must be capable of withstanding prolonged exposure to the elements and forces generated by pressure differentials between the inclosed space and the exterior. Since appreciable pressure upon the seals can be anticipated, it is important that strippable coating be applied over sufficient surface area around the opening to develop resistance to dislodgement. If the strippable coating is applied over tape, it should extend well beyond the tape. Application of bituminous coating over the strippable coating improves resistance to the elements and also lowers the water vapor transmission rate of the seal. The following basic methods of sealing will be used as applicable:

(1) *Edges, seams and joints.* For sealing openings of small surface area, strippable coating will be applied directly to the vessels. Bituminous coating will be applied over the strippable coating unless the area to be sealed is gasketed or otherwise reasonably airtight by construction.

(2) *Openings up to 3 inches.* In general, openings up to 3 inches will be masked with pressure-sensitive tape, then coated as described in (1) above. In some instances, it may be desirable to substitute a solid plug or blank in place of the tape.

(3) *Openings exceeding 3 inches.* Openings exceeding 3 inches in length and width will be covered with galvanized sheet metal or exterior grade plywood blanks. The blanks should be secured by means of hookbolts, strongbacks or other fasteners which do not require welding to the vessel. Welding for this purpose should be avoided if possible because of the time and cost of grinding, chipping and replacement of multiple paint coatings at time of activation. Sealing around blanks will be performed as described in (1) above.

(4) *Raised accesses.* For escape hatches and similar openings having covers which fit over coaming, sealing will be performed by trowling the cover and the coaming or by one of the methods described above. Opening mechanisms in covers will be masked and sealed in accordance with applicable provisions of (1) and (2) above.

(5) *Hulls of dry stored vessels.* Wherever possible, sealing of hulls of dry stored vessels for dehumidification will be performed on the exterior of vessels. This will permit opening and drying of injection and suction lines to their termination at the hull. It will also permit easier inspection and repair of the seals.

(6) *Openings on wet stored vessels.* Wherever possible, sealing of openings above the main deck will be performed from the exterior of the vessels. Sealing of piping below and near the water line will be attained by insertion of blank flanges in the lines as near to the hull as feasible.

b. Testing. Sealing performed for dynamic dehumidification will be tested to insure that the degree of air tightness attained will permit economical operation of the dehumidifier. A properly sealed area should retain at least 50 percent of a pressure, or vacuum of 1 ounce per square inch, or 2 inches of water for a period of 5 minutes. Air will be introduced into, or withdrawn from, the sealed area by the use of a blower, air line, or pump. When the desired pressure differential is attained, the blower, air line, or pump will be turned off. A pressure gage or monometer, connected to the area under test, will be observed for 5 minutes. If a pressure loss of more than 50 percent is noted during that period, the sealing should be checked for deficiencies. If a blower is used to create the air pressure, it will be necessary to include an airtight shutoff device on the blower line to maintain the pressure or vacuum after the blower is turned off. If compressed air is used, the air may be introduced more rapidly into a large area by attaching several compressed air lines to a manifold, with the manifold connected to the area under test. Typical examples of air eductors and monometer are shown in figures 3 and 4. Figure 3A shows a field fabricated blower suitable for testing small enclosures. Figure 3B shows the M-S-A Lamb Air-Mover, a product of Mine Safety Appliance Company, used for testing large enclosures.

140. Establishing Limits of Zones. For the purpose of this bulletin a zone will be considered to constitute the total area to be dehumidified by a single dehumidification system. It is evident that a zone may consist of a series of compartments, tanks, and void spaces, either within one vessel or a group of vessels The total volume within a single zone must not exceed the capacity of the dehumidification machinery. The nominal capacities of dehumidification machines are not absolute criteria of volumes which they can service, since the loads imposed upon them vary, not only with volume of air but also with the effectiveness of the sealing of the zone. Discretion must be used in deciding the extent of which a vessel is to be dehumidified. Inclusion or exclusion of void spaces, empty storerooms, and other marginal areas should be determined after consideration of machine capacity, amount of additional ductwork, and difficulty in excluding the questionable area from the zone. In general, where such areas constitute a small part of the total volume of the vessel, they should be included in the dehumidification system. Conversely, when such areas constitute a major part of the vessel and the dehumidification would require use of additional machines, they should be excluded from the areas to be dehumidified.

141. Preparation of Zone. *a.* It is essential that all water be removed from bilges, voids, tanks, piping systems, pumps, boilers, and heating units within areas to be dehumidified. Failure to remove all water increases greatly the load upon the dehumidification machine and my result in corrosion damage. All fuel and lubricating oil will be removed except for oil left in housing for purposes of preservation.

b. Air circulation and water vapor diffusion within the zone will be encouraged by opening doors and hinged covers, removal of manhole and handhole covers, opening dampers in ventilators, opening valves, disconnection or removal of hoses and flexible connections in piping and shifting removable deck boards and deck plates.

CHAPTER 7

COCOONING INSTRUCTIONS

142. General. The basic requirements for the cocooning of vessels involves the application of three coats of sprayable plastic coating, one coat of bituminous coating, and one coat of aluminum coating, plus the installation of a dynamic dehumidification system. The cocoon is bonded to the hull sides and supported by wood framing. The wood framing extends from the main deck level up to and including the superstructure, and is so constructed as to allow access to the interior of the cocoon for inspection purposes. Vessels painted with vinyl paints on the hull sides present a perfect bonding surface for the cocoon skin. The hull sides of vessels coated with conventional paint require a permanent bonding area. This bonding area is obtained by sandblasting an 8 inch band to "White Metal" and applying an inorganic zinc coating conforming to MIL-P-23236.

143. Preparation of the Package. Cushioning material will be applied to all sharp edges and projections of the item and wood framing. The item and wood framing will be covered with a snug-fitting shroud of osnaburg cloth conforming to FED-CCC-C-429. The shroud will be fastened to the bonding area with adhesive conforming to FED-MMM-A-189. The fabric will be the base for the sprayable plastic coating.

144. Sprayable Plastic Coating. The fabric will be sprayed with three coats of sprayable plastic conforming to type I, class 2 of MIL-C-3254. Each coat will be dyed a different color as visual aid to obtain adequate coverage. The first coat is dyed yellow, the second red and the third blue. The plastic will be dyed by adding 2 ounces to each 5 gallons of plastic solution, using butter yellow aniline dye (FSN 6820-285-8458), red aniline dye (FSN 6820-286-5484), and blue aniline dye (FSN 6820-255-8201) respectively for the first, second and third coats. The recommended pressures are 20 to 30 pounds on the fluid tank and 70 pounds minimum atomizing pressure at the gun. The fluid pressure will be increased when more than one gun is used. The gun should be held 8 inches from, and perpendicular to, the surface being coated. The surface of the coating should appear wet and glossy. The thickness of each coat will be approximately .015 inch. When the density of color of the sprayed coat matches that of the material in the supply tank, it would indicate that the thickness is correct.

145. Bituminous Coating. The coating material will conform to type II of MIL-C-3254. The type I plastic coating must be allowed to dry thoroughly 24 to 48 hours before the bituminous coating is applied. The coating should be approximately .125 inch thick. Recommended air pressure at the gun is 60 to 90 pounds.

146. Aluminum Coating. The bituminous coating must be dry (usually 72 hours are needed) before the aluminum coating is applied. The aluminum coating solution will conform to type III of MIL-C-3254. The coating should be .002 to .003 inch thick. Recommended gun pressure is 60 pounds.

147. Fume Exhaust. An exhaust blower, powered by an air motor or by an explosion-proof motor, will be used to exhaust hazardous fumes generated by spraying of the barrier materials. For convenience the exhaust may be attached to the outer terminus of one of the air circulation ducts. The exhaust should be operated not only during the spraying operations but also intermittently until the materials are dry. The fumes must be thoroughly exhausted from the completed package before the dehumidifier is placed in operation.

148. Installation of Ductwork. The dry air and moist air return ducts will be of 4-inch diameter downspout or flexible tubing. A suitable or wooden support will be used for securing the ducts at the points of intersection with the barrier. The dry air and moist return lines will terminate as near opposite ends of the package as practicable. The dry air lines will be carried upward 6 to 8 feet above the deck. The moist air will be drawn from the bottom of the package, preferably inside engine compartment near the floor plates.

149. Humidistat. A humidistat will be set to maintain a 40 percent relative humidity plus or minus 5 percent within the dehumidified zone. The humidistat will be installed near the center of the package. Wiring will be attached in accordance with wiring diagram furnished with the instrument.

150. Dehumidification Machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating current, will be attached to the dry air and moist air ducts and humidistat. The machine will be located outside the package. To prevent damage to the motor, full current must be delivered to the dehumidification machine.

151. Sensing Elements. Humidity sensing elements of an approved type will be placed as required within the package, with leads extending to a central location near the access door.

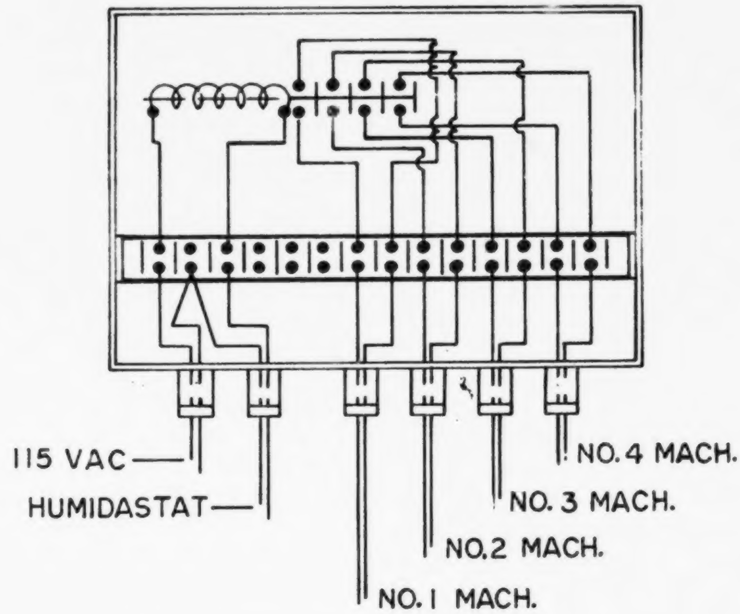


Figure 1. Relay box, for Multiple D. H. Installation.

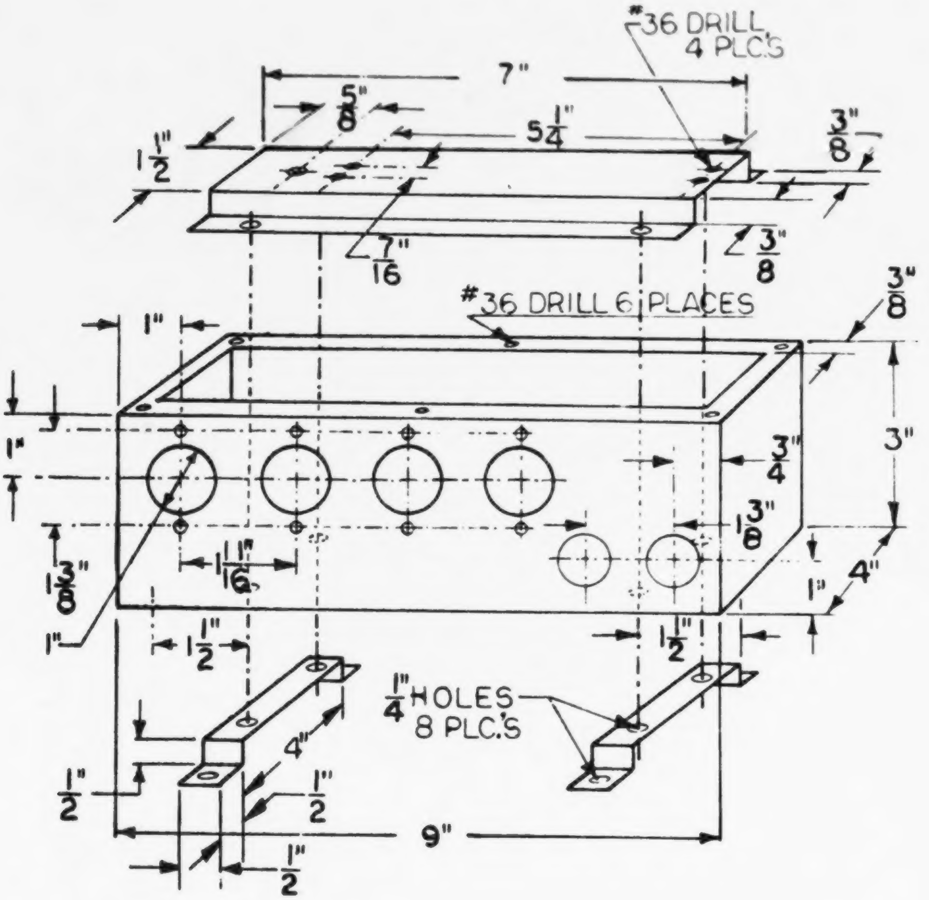


Figure 2. Relay box cover.

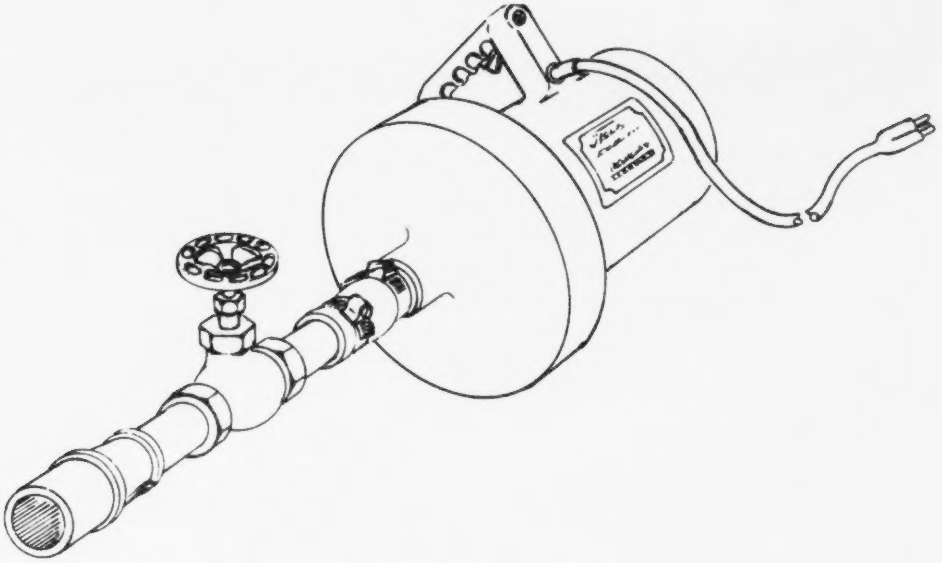


Figure 3A. Air eductor, blower motor.

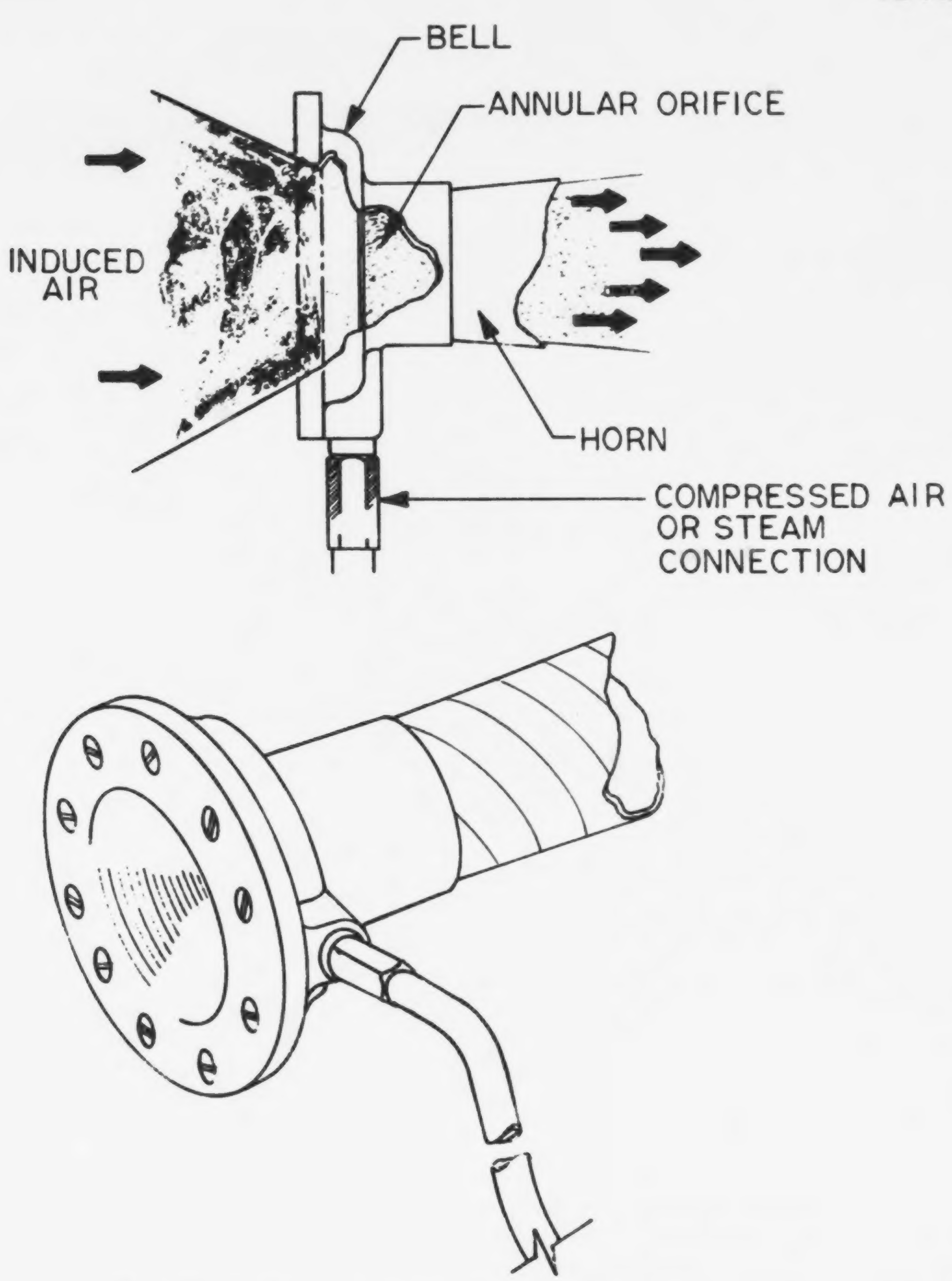


Figure 3B. Air eductor—air mover ventilator compressed air or steam.

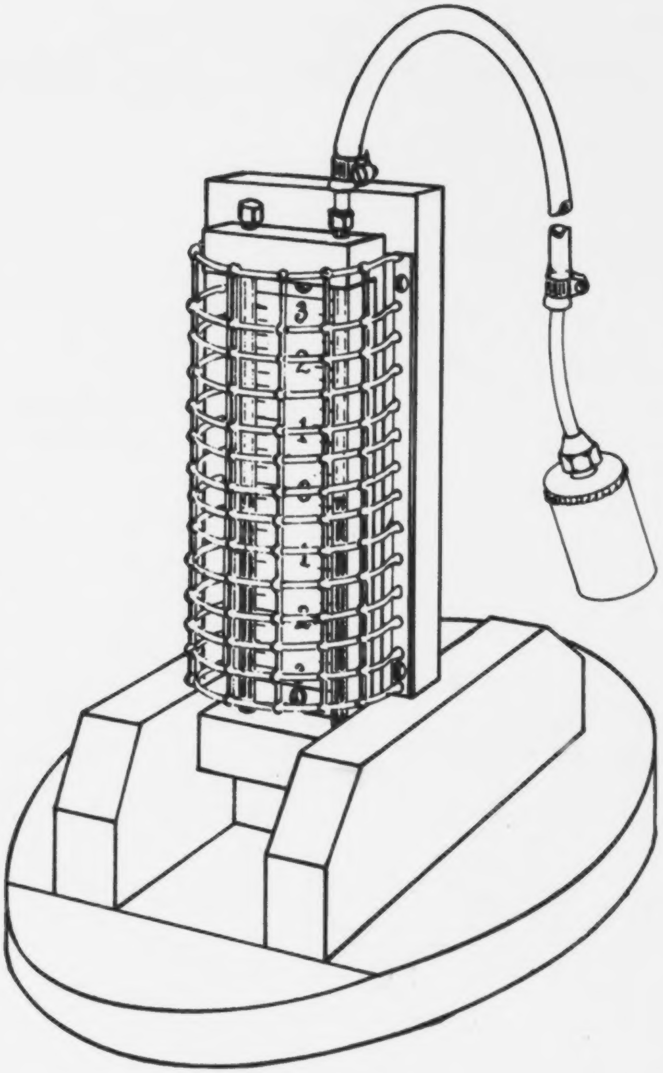


Figure 4. Manometer.

APPENDIX A

REFERENCES

1. Military Standards.

MIL-STD-107	Preparation and Handling of Production Equipment for Shipment and Storage
MIL-STD-129	Marking for Shipment and Storage

2. Regulations.

AR-750-1	Maintenance of Department of the Army Watercraft and Amphibians
AMCR 750-22	Drydocking Painting and Condition of Vessel Bottom Report

3. Specifications.

FED-L-P-378	Plastic Film (Polyethylene Thin Gage)
FED-O-A-548	Antifreeze, Ethylene Glycol, Inhibited
FED-O-I-490	Inhibitor, Corrosion, Liquid Cooling System
FED-NN-P-530	Plywood, Flat Panel
FED-UU-T-81	Tag, Shipping And Stock
FED-TT-P-664	Primer, Coating, Synthetic, Rust-Inhibiting, Lacquer-Resisting
FED-TT-T-291	Thinner, Paint, Volatile Spirits (Petroleum-Spirits)
FED-T-R-571	Rope, Cotton
FED-VV-L-751	Lubricating Oil, Chain, Wire Rope, Exposed Gear
FED-VV-F-800	Fuel Oil, Diesel
FED-VV-L-800	Lubricating Oil, General Purpose, Preservative, (Water-Displacing, Low Temperature)
FED-VV-P-236	Petrolatum, Technical
FED-CCC-C-429	Cloth, Osnaburg, Cotton
FED-MMM-A-189	Adhesive, Synthetic Rubber, Hot or Cold Bonding
FED-PPP-P-40	Packaging And Packing Of Hand Tools
FED-PPP-T-60	Tape, Pressure Sensitive, Adhesive Waterproof for Packaging
MIL-P-116	Preservation, Method of
MIL-B-121	Barrier Material, Greaseproof, Waterproofed, Flexible
MIL-R-196	Repair Parts for Internal Combustion Engines, Packaging of
MIL-L-2104	Lubricating Oil, Internal-combustion Engine, Heavy-duty
MIL-C-3254	Coating-system, Bridging, Strippable Sprayable
MIL-I-3420	Packing Materials, Volatile Corrosion Inhibitor, Treated, Opaque
MIL-D-3464	Desiccants, Activated, Bagged, Packaging Use and Static Dehumidification
MIL-H-8796	Hose, Airduct, Flexible, for Aircraft
MIL-R-10036	Rust Arresting Coating (For Treatment of Rusted Metal)
MIL-C-10382	Corrosion Preventive, Petrolatum, Spraying Application, for Food Handling Machinery And Equipment
MIL-C-10597	Cleaning Compound with Conditioner and Inhibitor for Engine Cooling System
MIL-G-10924	Grease, Automotive and Artillery
MIL-C-11796	Corrosion Preventive Compound, Petrolatum, Hot Application
MIL-C-11755	Compound, Antifreeze, Arctic-Type
MIL-P-13983	Paint, Temporary, Lusterless, Gasoline Removable
MIL-C-16173	Corrosion Preventive Compound, Solvent Cutback, Cold-Application
MIL-C-16555	Coating Compound, Strippable, Sprayable
MIL-E-17555	Electronic And Electrical Equipment, Accessories and Repair Parts, Packaging and Packing Of
MIL-S-18718	Cleaning Compound, Solvent

MIL-L-21260	Lubricating Oil, Internal Combustion Engine, Preservative And Break In
MIL-I-22110	Inhibitor, Corrosion, Volatile, Crystalline
MIL-P-23236	Paint Coating Systems, Steel Ship Tank, Fuel And Salt Water Ballast
MIL-A-46153	Antifreeze, Ethylene Glycol, Inhibited, Heavy Duty, Single Package
MIL-T-46755	Tires, Pneumatic And Tires, Semi-pneumatic, Installed On Vehicles, Preparation For Storage

4. Bulletins.

SB 38-100	Preservation, Packaging and Packing Materials, Supplies and Equipment Used by the Army
TB 43-0144	Painting of Vessels
TB 55-1900-201-35/1	Guide to Inspection and Survey of Watercraft, Wood hulls and steel hulls

5. Technical Manuals.

TM 38-230	Preservation, Packaging and Packing Military Supplies and Equipment
TM 38-750	The Army Maintenance Management Systems (TAMMS)

6. Forms.

DA Form 3256	Preservation and Depreservation Guide for Marine Equipment

7. Drawings - Buships

ATA 121 S3803 40A223 ALT
Dehumidification Arrangement
Diagram for ATA 121 Class Tug

Y0113-S3803-B92949 ALT 3
Dehumidification Arrangement
Diagram for Y0113 Tanker

APPENDIX B
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR LANDING CRAFT, MECHANIZED, DIESEL, STEEL, 56 FT., MARK VI, DESIGN LCM-6

1. General. This appendix provides detailed instructions for preparation of the mechanized landing craft, design LCM-6, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Lazaret.* The following items will be removed, identified, and stowed in the lazaret:

(a) Wing compartment access covers.
(b) Four vent cowls.
(c) Emergency tiller and access plate.
(d) Bottom drain plugs.
(e) Ramp drain plugs.

(2) *Engine room.* The following items will be removed, identified, and stowed in the engine room:

(a) Electric horn.
(b) Mushroom cover.
(c) Mast.
(d) Navigation lights.
(e) Bell.
(f) Anchor.

(3) *Air heater assembly.* The cover will be removed from the air heater. The electrode assembly will be removed, cleaned of carbon and secured with the cover adjacent to the place of removal.

(4) *Ramp.* The 50-inch lengths of 5/8-inch plow steel cable and two 5/8-inch wire rope clips for each cable will be applied to support ramp in partially open position.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The engine room and cab of each landing craft will be prepared for dehumidification. Normally a dynamic dehumidification system will be installed for each group of four vessels as shown on figure 5 or 6.

(2) *Provision for ventilation and air circulation.*

(a) Ramp drain openings. Ramp drain openings will be covered with standard aluminum insect screen.

(b) Bottom drain openings. Bottom drain openings will be covered with standard aluminum insect screen.

(c) Lazaret. A galvanized gooseneck-type or turbine-type ventilator will be installed in the lazaret openings. The opening in the ventilator will be covered with standard aluminum insect screen.

(d) Void spaces. Void spaces in the side wing compartments will be provided with vents to allow circulation of air. Minimum 3-inch diameter, galvanized gooseneck-type or turbine-type ventilators will be secured in the access port openings. Openings in the ventilators will be covered with standard aluminum insect screen.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below.

(a) Cab.

1. Roof. A roof will be fabricated of No. 20 gage galvanized sheet metal and 1/8 x 1-inch angle irons in accordance with figure 8. The length of the angle irons will equal the outside longitudinal dimensions of the cab. The vertical faces will be cut back the thickness of the bulkhead, in order that the installed roof will be supported by the horizontal faces of the angle irons bearing on the fore and aft bulkheads. The sheet metal will be formed to provide a lip of approximately 2 inches all around. All seams will be sealed on the inside with bituminous coating. The installed roof will be sealed to the cab with 4-inch wide pressure sensitive tape applied all around the lip. The roof, tape, and adjacent surfaces will be coated with strippable coating and bituminous coating.

2. Cab door. The door will be secured in closed position. The door edges and door handle will be sealed with strippable coating and bituminous coating.

3. Cab drains and peepholes. Drains and peepholes will be masked with pressure-sensitive tape and covered with strippable coating and bituminous coating, except that one of the peepholes in each cab will be blanked in order to permit installation of a sensing element.

(b) Engine room.

1. Access hatch. The access hatch to the engine room will be sealed by troweling bituminous coating into the aperture between the coaming and closed cover.

2. Ventilator trunk openings. The openings not used for dehumidification system ducts (Figures 5 and 6) will be plugged or capped from the outside, using 1/4-inch exterior grade plywood or No. 20 gage galvanized sheet metal, and sealed with strippable coating and bituminous coating. The timber holes in the cowl vent box will be sealed with strippable coating and bituminous coating.

3. Exhaust stack. The stack will be capped or plugged, then sealed with strippable coating and bituminous coating.

4. Hull penetrations. All openings in the hull that lead to the engine room, except the raw water intake pipe in the keel cooler recess, will be closed with fitted wood plugs, then sealed with strippable coating and bituminous coating.

(c) Sealing of dehumidification piping system. The connecting points of all air tubing or ducts to areas to be dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adaptors, and other devices used to attach or introduce the tubing or ducts. All joints in the tubing or ducts will be similarly sealed.

(d) Ramp gasket. The area between the free edge of the gasket and the hull will be coated with strippable coating.

(e) Ramp hinges. The exposed rubber surfaces of the hinges will be coated with strippable coating.

(f) Propellers and shafts. Using strippable coating a seal will be applied around the propeller shaft at the stern tube, at both ends of the strut bearing, at the propeller, an over the propeller shaft nut. The stern tube sea water scoops will be sealed with the same coating.

(g) Deleted.

(4) *Dynamic dehumidification installation.*

(a) Dehumidification machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic feet capacity, 110-volt alternating current, will be installed as shown on figure 5 or 6. The machine will be mounted on a stand and protected with a cover fabricated in accordance with figure 7.

(b) Machine connections. Connections of ducts to the dehumidification machine will be made of unions or slip joint connections which permit easy removal of the machine for servicing.

(c) Duct installation. Four-inch diameter, No. 26 gage, galvanized tubing, with necessary ells, reducing fittings and connections, will be installed generally as shown on figure 5 or 6. Flanges of galvanized metal or ½-inch thick exterior grade plywood will be joined to the ductwork to attach it to the vent trunk openings. A hole in the flange for the passage of the humidistat cable will be provided in accordance with figure 5 or 6. The flanges will be constructed with collars or suitable tabs to resist dislodgement from the vent trunks.

(d) Ductwork support. Ductwork run on deck will be supported on metal or wood stanchions. The ducts will be fastened to the stanchions by galvanized strapping secured to the stanchions.

(e) Humidistat. A hair type humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified area. The humidistat will be installed in the engine room of the landing craft remotely serviced by the dehumidification machine as shown in figure 5 or 6. The humidistat will be secured approximately 3 feet above the floor plate level. The humidistat will be wired to the dehumidification machine by means of No. 18, two-conductor, rubber covered cable, passing through the vent trunk opening. The cable will be secured to prevent any movement of the cable with respect to the flange over the opening.

(f) Humidity sensing elements. Humidity sensing elements will be installed as follows:

1. Engine room. A humidity sensing element with cable will be installed in each engine room. The sensing element contact will be mounted in the side of the duct, just above the connection to the vent trunk opening. The sensing element and cable will be run down the inside of the duct and will be supported in such a manner that they are secured against motion and contact with metal or other conductive surfaces.

2. Cab. A humidity sensing element without cable will be installed in the cab of each vessel. The sensing element will be mounted in the opening provided in the blanked peephole of each cab.

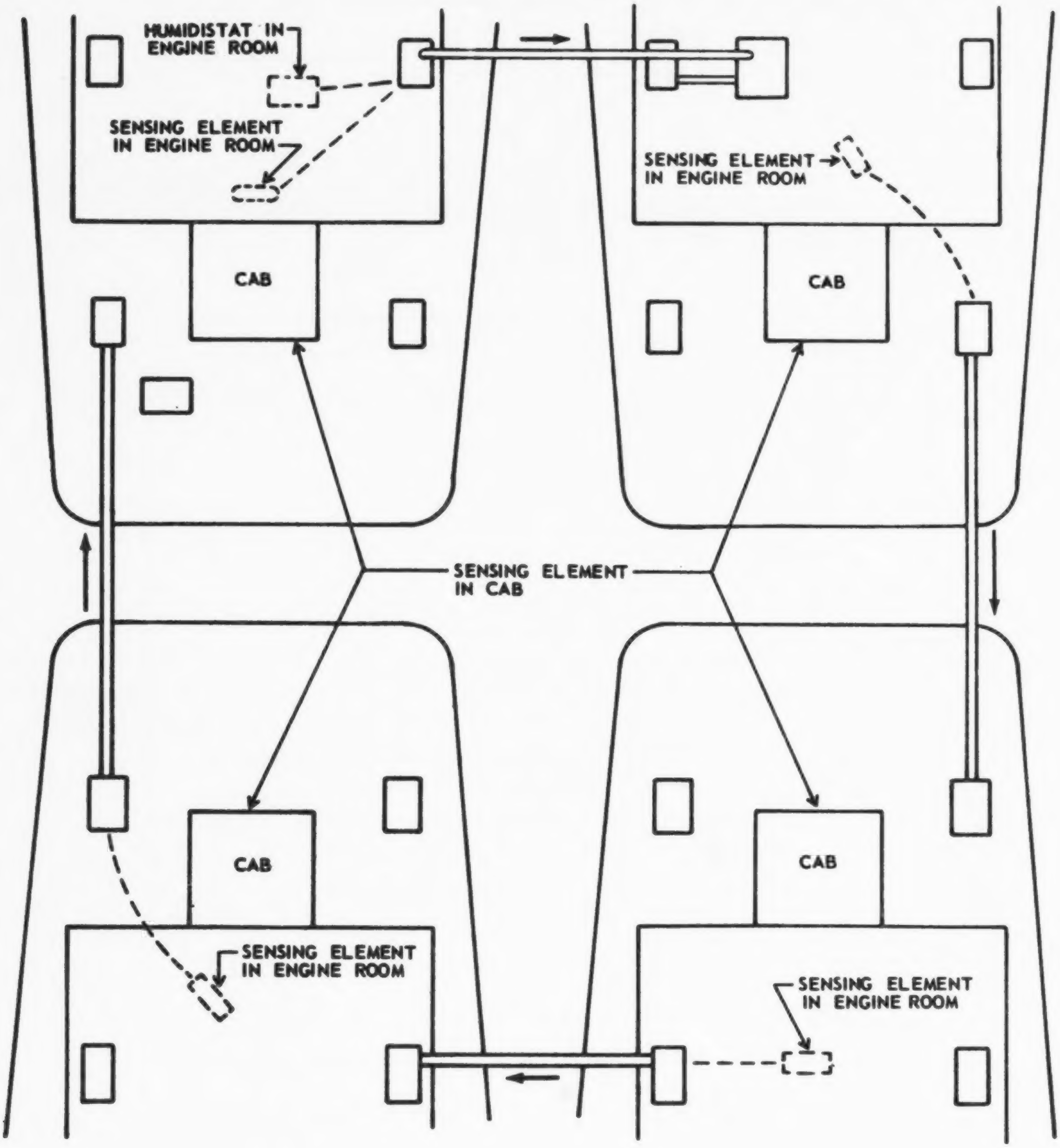

HUMIDISTAT IN ENGINE ROOM
SENSING ELEMENT IN ENGINE ROOM
SENSING ELEMENT IN ENGINE ROOM
CAB
CAB
SENSING ELEMENT IN CAB
CAB
CAB
SENSING ELEMENT IN ENGINE ROOM
SENSING ELEMENT IN ENGINE ROOM

Figure 5. Dehumidification for craft stored stern to stern.

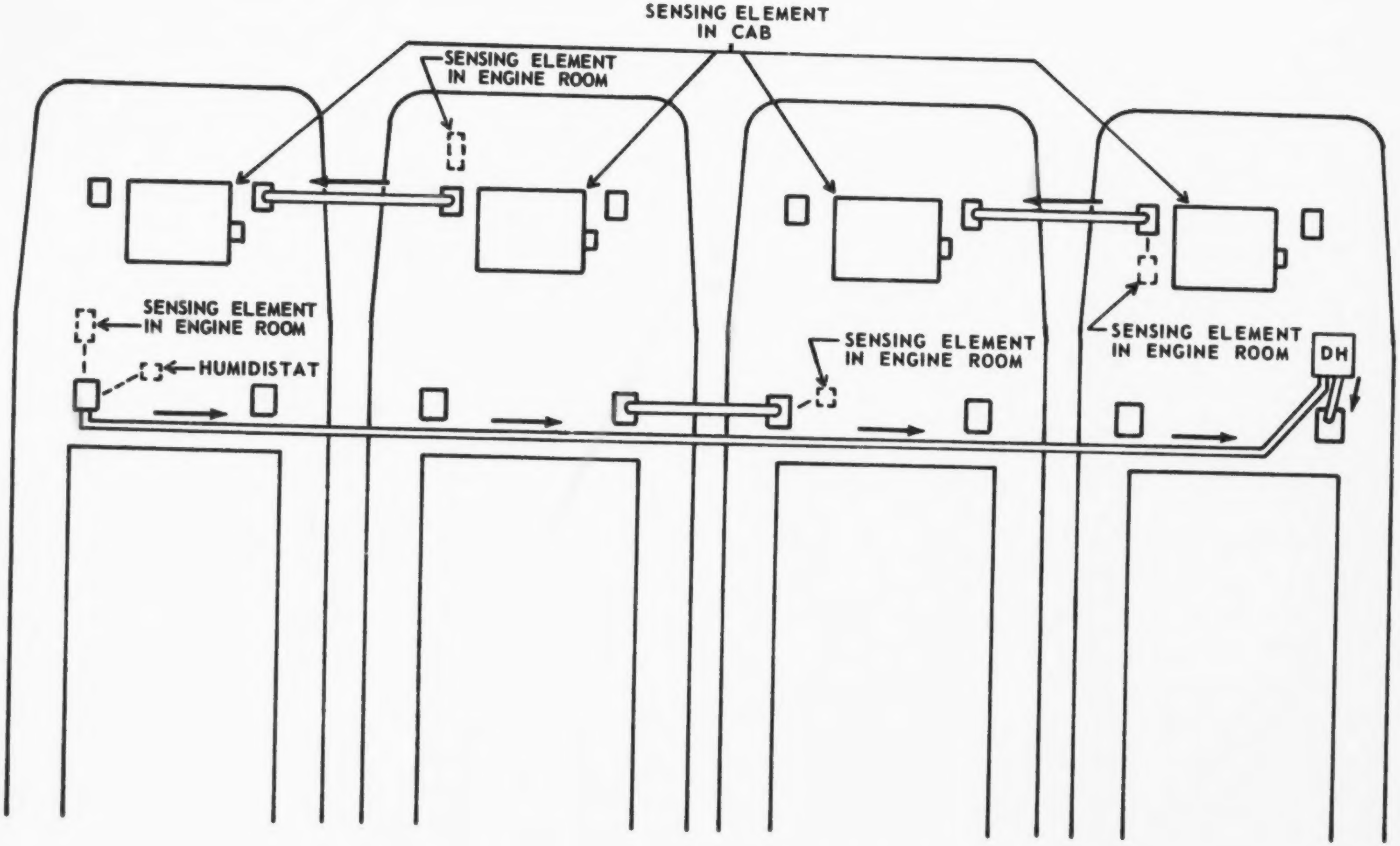
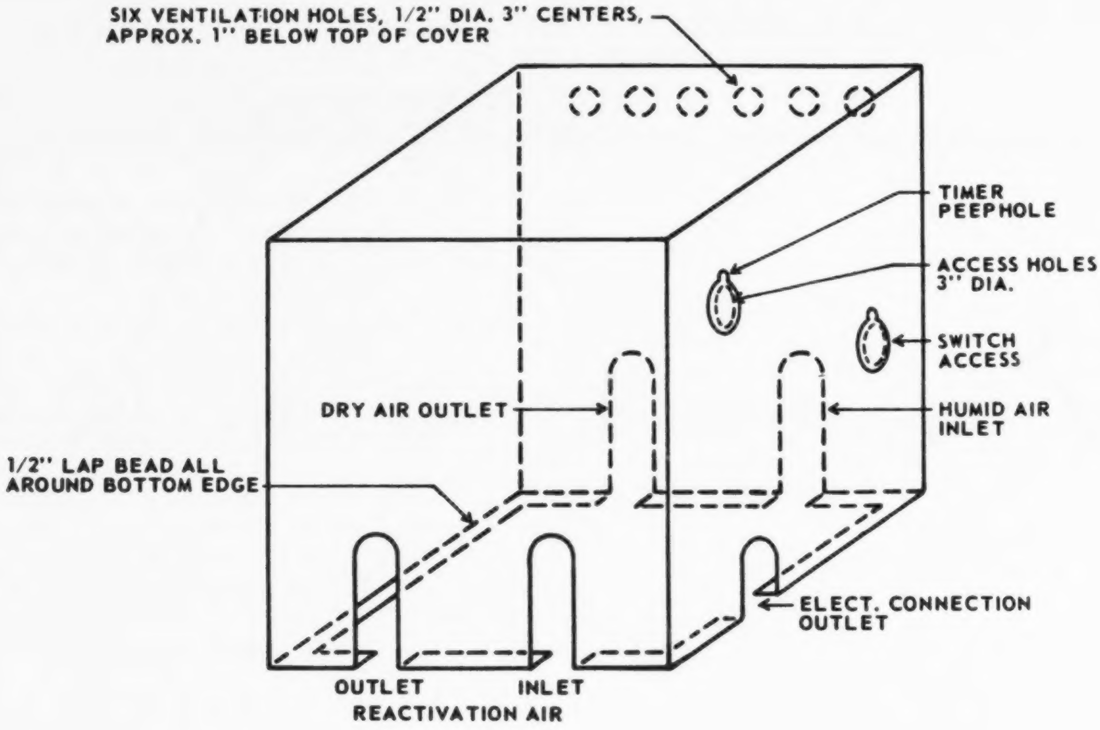
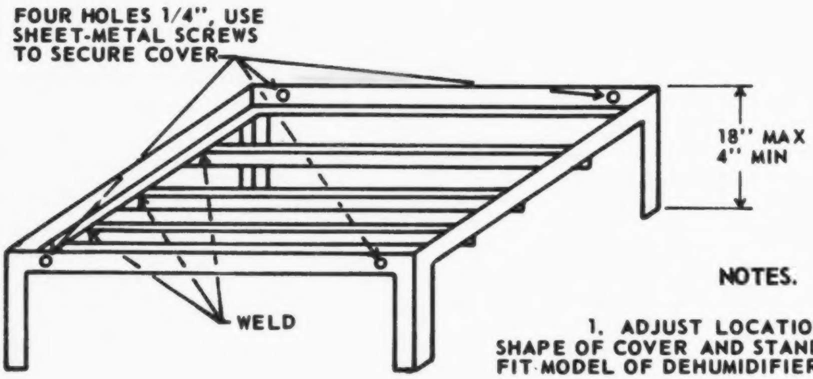

SENSING ELEMENT IN CAB
SENSING ELEMENT IN ENGINE ROOM
SENSING ELEMENT IN ENGINE ROOM
HUMIDISTAT
SENSING ELEMENT IN ENGINE ROOM
SENSING ELEMENT IN ENGINE ROOM
DH

Figure 6. Dehumidification for craft stored side by side.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 7. Typical cover and stand for dehumidifier.

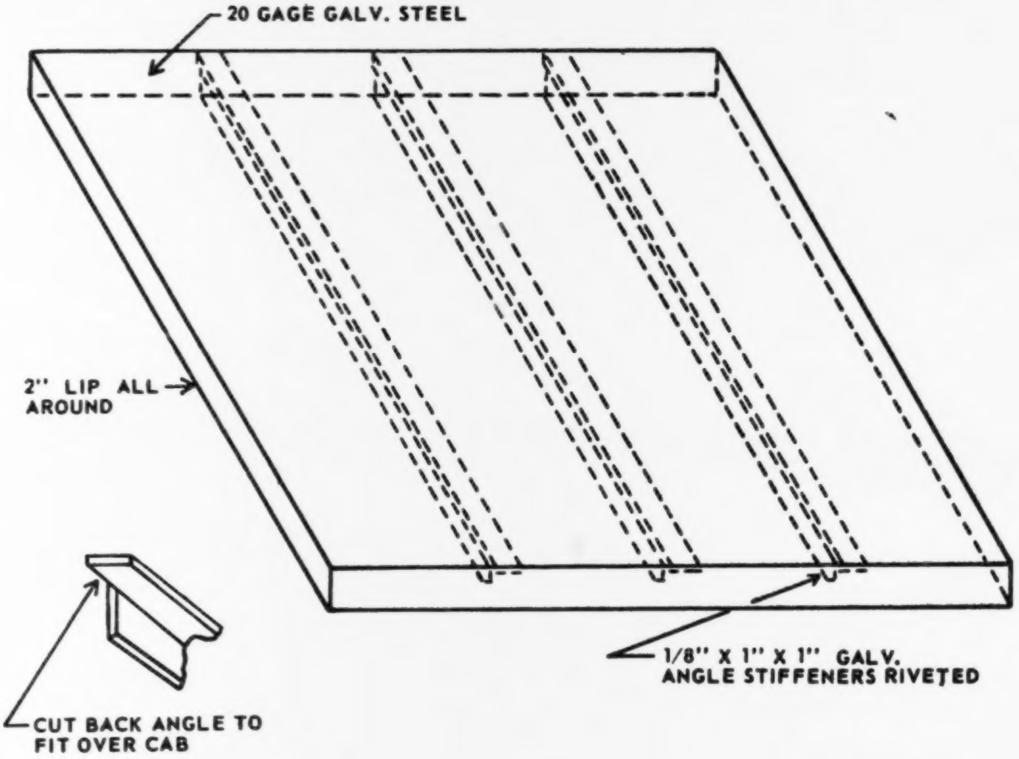

20 GAGE GALV. STEEL
2" LIP ALL AROUND
1/8" X 1" X 1" GALV. ANGLE STIFFENERS RIVETED
CUT BACK ANGLE TO FIT OVER CAB

Figure 8. Cab cover.

APPENDIX C
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR LANDING CRAFT, MECHANIZED, DIESEL, STEEL, 69 FT, MARK VIII, DESIGN LCM-8

1. General. This appendix provides detailed instructions for preparation of the mechanized landing craft, design LCM-8, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Cab.* The following items will be removed, identified, and stowed in the cab:

(a) Drain plugs.

(b) Docking plugs.

(2) *Lazaret.* The following items will be removed, identified, and stored in the lazaret:

(a) Navigation lights.

(b) Stanchions, lifelines, and fittings.

(c) Deck plate keys.

(d) Horn.

(e) Emergency tiller.

(f) Spare propeller shafts.

(g) Ventilator cowls.

(h) Tiller deck plate.

(i) Hand bilge pump access plates.

(j) The masts will be removed, identified and stowed in the engine room.

(3) *Exhaust manifold.* The exhaust pipe will be removed from the manifold to permit circulation of air.

(4) *Ramp door.* Treat the accessible surfaces of the interior of ramp door between the front and backing plates with rust arresting compound conforming to MIL-R-10036.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidifed area.* A dynamic dehumidification system will be installed to provide dynamic dehumidification of the cab, and engine room, the ramp cylinder compartment and the lazaret. Dry air lines and moist air return lines will be run to each of those areas, generally as shown on figures 9 and 10. However, for the purpose of air tightness, these areas will be considered as a single zone, with no attempt to seal between individual zones.

(2) *Ventilation of wing compartment.* Galvanized gooseneck or turbine type ventilators will be secured over the openings resulting from removal of hand bilge pump access plates. Drain plugs under void spaces will be removed, identified and secured to steering section of the operators cab.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below.

(a) Cab.

1. Roof. A roof will be fabricated of No. 20 gage galvanized sheet metal and 1/8 x 1 x 1 inch angle irons in accordance with figure 12. The length of the angle irons will equal the outside longitudinal of the cab. The vertical faces will be cut back the thickness of the cab bulkheads. The sheet metal will be formed to provide a lip of approximately 2 inches all around. All seams will be sealed to the cab with 4 inch wide pressure sensitive tape applied all around the lip. The roof, the tape and adjacent surfaces will be coated with strippable coating and bituminous coating.

2. Accesses. The accesses will be blanked with No. 20 gage galvanized sheet metal covers. The covers will be secured to cab bulkheads by means of riveted clips, or cutting and offsetting tabs on each of the four edges. The edges of covers will be sealed to the cab with 4 inch pressure sensitive tape and then coated with strippable coating and bituminous coating.

3. Drains and peepholes. Drains and peepholes will be masked with pressure sensitive tape and then coated with strippable coating and bituminous coating.

(b) Access hatches. The access hatches to the engine room and lazaret will be sealed by troweling bituminous coating into the aperture between the coaming and the closed cover.

(c) Ventilator trunk openings. The openings resulting from removal of the ventilator cowls will be plugged or capped, using ¼ inch exterior grade plywood or NO. 20 gage galvanized sheet metal, securely fastened and coated with strippable coating and bituminous coating. The plugs or caps over the vent trunk openings used for dehumidification system air ducts (figure 9 or 10) will be provided with holes of sufficient size to permit the entry of the air ducts.

(d) Fuel fill deckplates. The fuel fill deckplates will be sealed with strippable coating and bituminous coating.

(e) Sea-chest vents. The vents will be fitted with pipe plugs or masked with pressure-sensitive tape and sealed with strippable coating and

bituminous coating.

(f) Cargo deck drain wells. Adapters will be installed in the openings resulting from removal of docking plugs between frames No. 27 and 31. Lengths of rubber hose will be connected to the adapters and the cargo well drain piping at the couplings in the ramp cylinder compartment to permit draining through the hull exterior.

(g) Ramp cylinder compartment. The points at which the ramp cables enter the pipes at the forward bulkhead of the compartment will be sealed with strippable coating. Blanks fabricated from No. 20 gage galvanized sheet metal will be installed over the openings resulting from removal of the hand bilge pump access plates. The blanks will be provided with holes of sufficient size to permit the entry of the dehumidification system air ducts.

(h) Tiller deckplates. The openings resulting from removal of tiller deckplates will be covered with blanks fabricated from No. 20 gage galvanized sheet metal or ¼-inch plywood. The blanks will be provided with holes of sufficient size to permit the entry of the air ducts. The blank covering the tiller access used for the moist air return to the dehumidification machine (fig 9 or 10) will also be provided with a hole for the passage of the humidistat cable.

(i) Hull penetrations. Openings through the starboard side and port side of the hull and all drains in the bottom, except those specified in (2) above, will be closed with blanks, plugs or pressure-sensitive tape and then sealed with strippable coating and bituminous coating.

(j) Dehumidification piping system. The points of entry of all air ducts into compartments will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters and other devices used to attach or introduce the ducts. All joints in the ductwork will be similarly sealed.

(k) Propellers and shafts. Using strippable coating a seal will be applied around the propeller shaft at the stern tube, at both ends of the strut bearing, at the propeller, and over the propeller shaft nut.

(l) Rudder mountings. The rudder post bearing areas outside the hull will be sealed with strippable coating.

(m) Ramp. The ramp gate will be secured in closed position to remove torsional stress from the rubber hinges. For drainage and to prevent crushing the ramp gasket, a slight opening is necessary. Supports, under the base of the ramp, will be provided to relieve the hinges of all or part of the weight of the ramp. All openings in the ramp, except those along the hinged edge, will be masked with pressure-sensitive tape and coated with strippable coating and bituminous coating.

(n) Ramp gasket. The area between the free edge of the gasket and the hull will be coated with strippable coating.

(o) Ramp hinges. The exposed rubber surfaces of the ramp hinges will be coated with strippable coating.

(p) Deleted.

(4) *Dynamic dehumidification installation.*

(a) Machine installation. A package dehumidifier single desiccant bed, absorbent type, 10,000 cubic feet capacity, 110-volt, alternating current will be installed as shown on figure 9 or 10. The machine will be mounted on a stand and protected with a cover fabricated in accordance with figure 11. Normally the number of landing craft per dehumidification machine will be two. Figure 9 shows craft stored stern to stern. Figure 10 shows craft stored side by side. Connections of ducts to the dehumidification machine will be made by unions or slip joint connections which permit easy removal of the machine for servicing.

(b) Air duct. Galvanized ducts, No. 25 gage, with necessary fittings, supports and connections will be installed. Ducts will run with a minimum of bends and approximately as shown on figure 9 or 10. The ducting will be as follows:

1. Craft stored stern to stern (fig. 9).

(a) Duct No. 1. From the dry air connection of the dehumidification machine to the hand bilge pump port of the starboard ramp cylinder compartment.

(b) Duct No. 2. From the hand bilge pump port of the portside ramp cylinder compartment to the forward port engine room vent.

(c) Duct No. 3. From the aft starboard engine room vent to the aft port engine room vent of the second craft.

(d) *Duct No. 4.* From the forward starboard engine room vent to the hand bilge pump port of the starboard ramp cylinder compartment.

(e) *Duct No. 5.* From the hand bilge pump port of the portside ramp cylinder compartment to the port tiller access.

(f) *Duct No. 6.* From the starboard tiller access to the port tiller access of the first craft.

(g) *Duct No. 7.* From the starboard tiller access to the moist air connection of the dehumidification machine.

2. Craft stored side by side (fig. 10).

(a) *Duct No. 1.* From the dry air connection of the dehumidification machine to the aft port engine room vent.

(b) *Duct No. 2.* From the forward, starboard, engine room vent to the hand bilge pump port of the starboard ramp cylinder compartment.

(c) *Duct No. 3.* From the hand bilge pump port of the portside ramp cylinder compartment to the starboard hand bilge pump port of the second craft.

(d) *Duct No. 4.* From the portside hand bilge pump port to the forward starboard engine room vent.

(c) *Duct No. 5.* From the aft port engine room vent to the port tiller access.

(f) *Duct No. 6.* From the starboard tiller access to the port tiller access of the first craft.

(g) *Duct No. 7.* From the starboard tiller access to the moist air connection of the dehumidification machine.

(c) *Ductwork supports.* Ductwork run on deck will be supported on wood or metal stanchions. The ducts will be fastened to the stanchions by galvanized strapping secured to the stanchions.

(d) *Humidistat.* A hair type humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified area. The humidistat will be installed in the lazaret of the craft on which the dehumidification machine is mounted. The humidistat will be mounted and secured approximately 3 feet above the floor plate level in the ladder leading from the lazaret access hatch. The manufacturer's instructions will be followed in making the electrical connections. The humidistat will be connected to the machine with a No. 18 two-conductor rubber-covered cable with suitable terminal connectors.

(c) *Humidity sensing elements.* Humidity sensing elements will be installed as follows:

1. Lazaret. One sensing element with cable will be installed in the lazaret of the craft on which the humidistat is not mounted. The element contact will be mounted in the side of the air duct, just above the connection to the compartment opening shown on figure 9 or 10. The element and the cable will be run down the inside of the duct and supported clear of the end of the duct in a manner to secure it against motion and contact with metal or other conductive surfaces.

2. Cab. A humidity sensing element without cable will be installed in cab of each craft. The sensing element will be installed in the metal blanks covering the cab doorways.

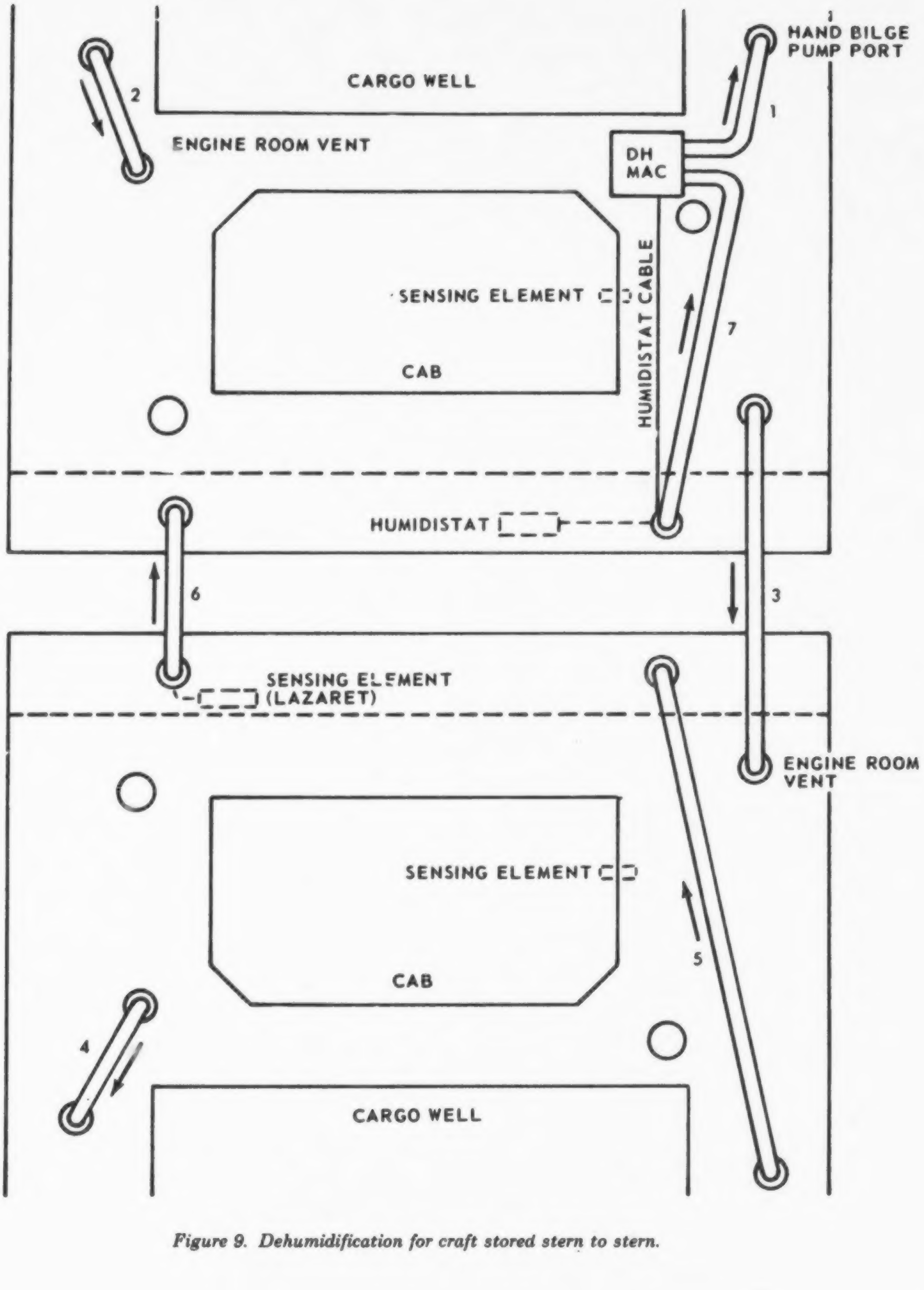


Figure 9. Dehumidification for craft stored stern to stern.

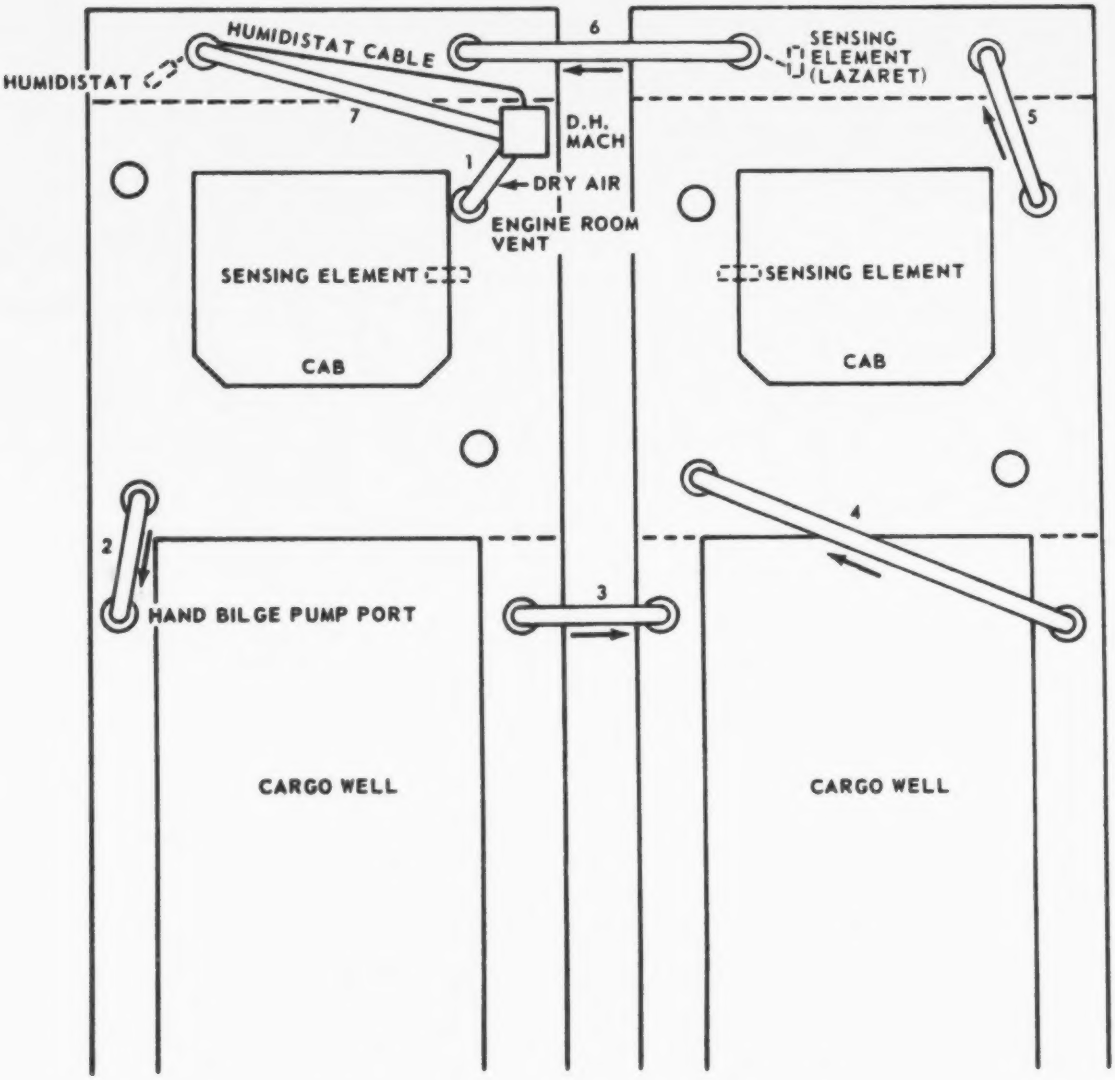
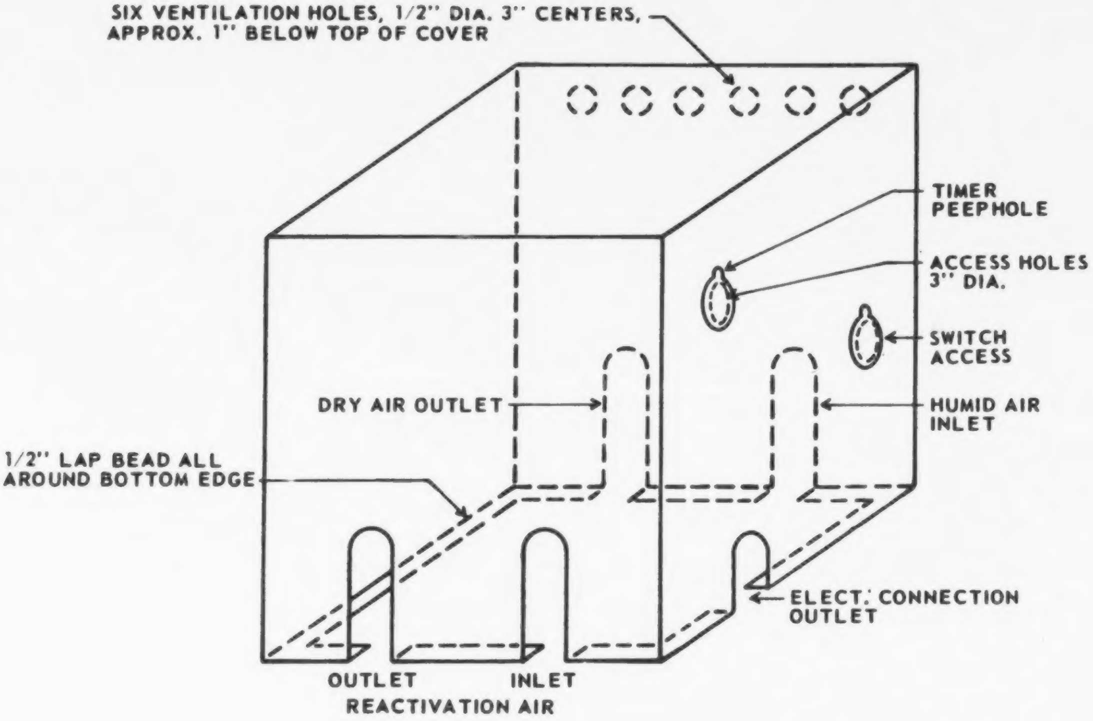
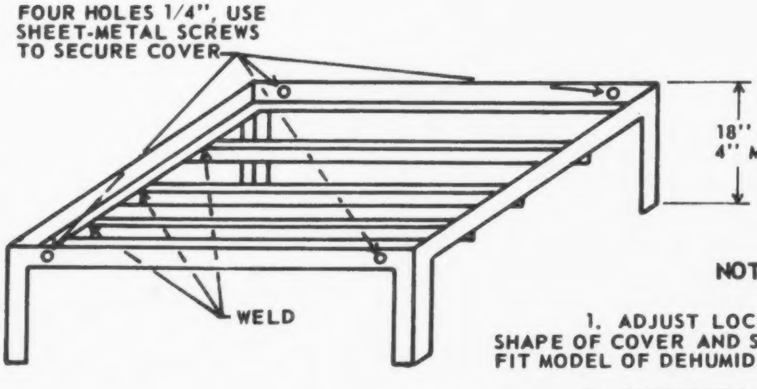


Figure 10. Dehumidification for craft stored side by side.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 11. Typical cover and stand for dehumidifier.

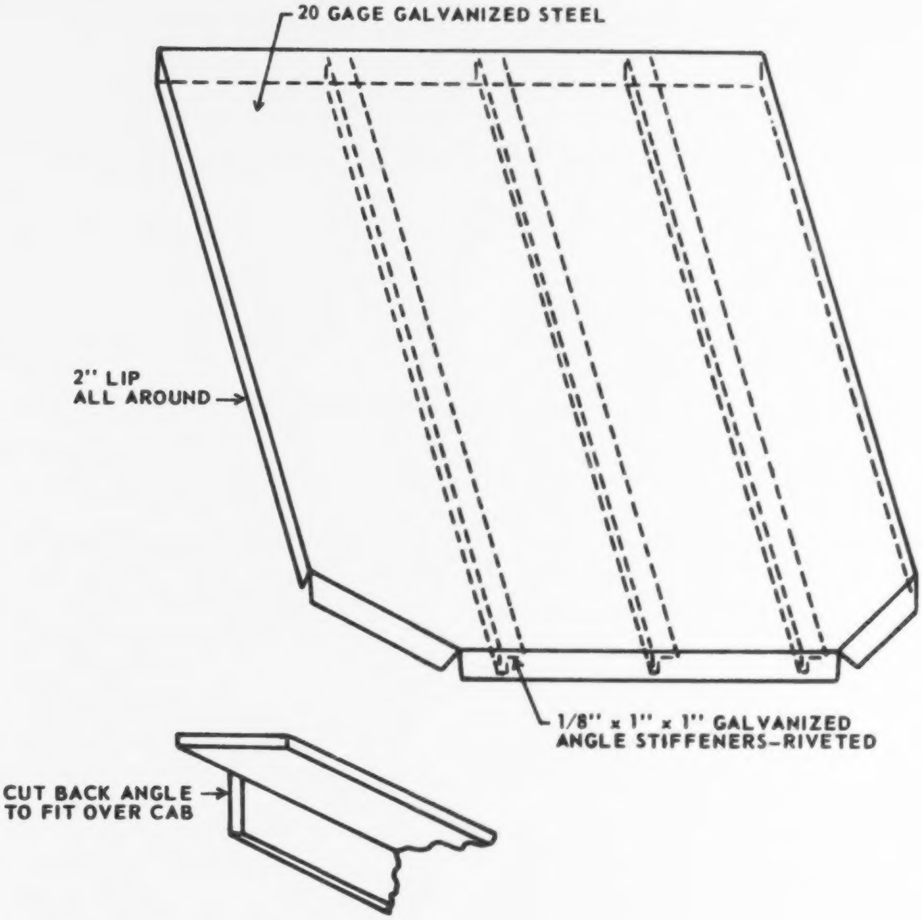

20 GAGE GALVANIZED STEEL
2" LIP ALL AROUND
1/8" x 1" x 1" GALVANIZED ANGLE STIFFENERS-RIVETED
CUT BACK ANGLE TO FIT OVER CAB

Figure 12. Cab cover.

APPENDIX D

DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR LANDING CRAFT, UTILITY, 105 FOOT, DIESEL POWERED, NAVY DESIGN LCU 1466 CLASS

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1. General. This appendix provides detailed instructions for preparation of the utility landing craft, design LCU 1466 class, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Pilot house.* The following items will be removed, identified, and stowed in the pilot house:

(a) Whistle, bell, and windshield wipers.
(b) Side lights.
(c) Stern light and wake light.
(d) Gyrocompass repeater.
(e) Binnacle stand.
(f) Voice tube.
(g) Deck telephone.
(h) Blinker key control switch.

(2) *Crew quarters.* The following items will be removed, identified, and stowed in the crew quarters:

(a) Searchlight.
(b) Signal light.
(c) Anchor light and staff.
(d) Canvas covers (all).
(e) Toggle pins and chains for railing and staffs.
(f) Lifelines and stanchions.

(3) *Bow storeroom.* The following items will be removed, identified, and stowed in the bow storeroom:

(a) Mast stays.
(b) Portable davits.
(c) Hawsers.
(d) Spare anchor cable.
(e) Halyards.
(f) Blocks.

(4) *Mast.* The mast will be lowered and secured in that position.

(5) *Exhaust system.* Cleanout covers or plugs will be removed from the manifolds and secured adjacent to the openings. The flexible connections will be removed from the engine exhaust lines and secured nearby.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified areas.* Two zones of the landing craft will be prepared for dynamic dehumidification. The zones will consist of the following areas:

(a) *Zone No. 1.* The ramp winch room and the passage area directly aft, which are located on the forward port side of the craft, the storeroom and passage area which occupy corresponding positions on the starboard side, and the storage areas and voids below the well deck forward of the third transverse bulkhead will be included in zone 1.

(b) *Zone No. 2.* The pilot house, anchor winch covers, quarters, galley, switchboard room, engine rooms, generator rooms, boiler room, muffler room, and all other areas to which there is access from one or more of the above mentioned areas will be included in zone 2.

(2) *Provisions for air circulation.* Within each zone being dehumidified, all interior doors, hatch and scuttle covers, manhole covers, and handhole covers will be secured in open position or removed and secured as applicable. Galley range and refrigerator doors will be secured in open position. Enclosed switchboards, distribution panels, and other electrical assemblies will be exposed to air circulation by opening doors or loosening covers. All dampers in ventilation systems will be turned to open position. All tanks located in areas being dehumidified will be opened to circulation of air by removal of covers and drain plugs. Drain cocks, where present, will be opened. Covers and plugs will be tagged and secured adjacent to their places of use. To facilitate circulation of air through the boiler, the door of the combustion chamber will be secured in open position and the smokepipe disconnected at the boiler. The drain plug will be removed from the boiler, tagged and secured adjacent to its place of use.

(3) *Sealing for dynamic dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this

bulletin. Detailed sealing requirements are outlined below.

(a) *Engine exhaust.* The engine exhausts at the stern of the craft will be closed with metal caps or plugs which will be secured with pressure-sensitive tape. The entire closure and adjacent area will be coated with strippable coating and bituminous coating.

(b) *Boiler exhaust.* The boiler exhaust smokepipe will be disassembled at the hinged joint and secured on deck in the space provided for pipe storage. The stack will be secured in an inclined position to insure drainage. The exhaust stub will be blanked with No. 18 galvanized sheet metal. The blank and adjacent areas of the stub will be coated with strippable coating and bituminous coating.

(c) *Vents, fire mains, fill and overflow lines.* All vents, fire mains, fill and overflow lines opening into areas within the zones being dehumidified will be sealed with strippable coating and bituminous coating. For covering the vent screen in the aft cargo well bulkhead, a blank of No. 18 gage galvanized sheet metal will be applied, after which the edges will be coated with strippable coating and bituminous coating.

(d) *Doors, hatches, and manholes.* All exterior doors, hatches and manholes leading into a dehumidified zone, except those used for introduction of dehumidification piping, will be closed and sealed. Where hatch or manhole cover fits over a raised coaming, bituminous coating will be troweled into the aperture between the closed cover and the coaming. Flush type doors and covers will be sealed with strippable coating and bituminous coating. Recesses in covers for opening devices will be masked with pressure-sensitive tape and coated with strippable coating.

(e) *Windows.* If necessary, in order to provide the required tightness of the zones being dehumidified, the edges of windows and portlights will be sealed with strippable coating and bituminous coating.

(f) *Openings in forecastle deck.* The openings in the forecastle deck for the ramp cables will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating. The coatings will be extended over adjacent deck surfaces and also along the cables for at least 3 inches.

(g) *Dehumidification piping system.* The connecting points of all air tubing or ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the tubing or ducts. All joints and seams in the tubing and ducts will be similarly sealed.

(h) *Winch cover.* A sheet metal cover will be installed over the entire winch. The cover will be fabricated of minimum No. 18 gage galvanized sheet metal with suitable angle iron stiffeners. A coaming of 1 x 1/8-inch angle iron will be tack welded to the deck around the winch. The angle irons will be positioned with one face against the deck and the vertical face toward the winch. The size and shape of the coaming will be such that the sheet metal cover fits snugly over the vertical faces. The sheet metal cover will be fastened to the coaming by No. 12 sheet metal screws spaced approximately 3 feet apart. Openings for the air ducts specified hereinafter and for the sensing element will be provided. Apertures between the coaming and the deck will be filled with bituminous coating. All joints and seams will then be covered with strippable coating and bituminous coating.

(4) *Dynamic dehumidification installation.*

(a) *Dehumidification machines.* Two package dehumidifiers, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt alternating current, will be installed. The machines, with covers and stands fabricated in accordance with figure 15, will be located generally as shown in figures 13 and 14.

(b) *Duct installation.* Four inch diameter, No. 26 gage galvanized tubing with necessary ells, tees, reducing fittings, and connections will be installed generally as shown on figure 13 and 14. Ductwork will be supported on 2 x 4-inch wood stanchions. The ducts will be fastened to the stanchions by galvanized strapping.

1. Ducts to zone 1. To permit the introduction of air ducts to the compartments, the following exterior doors will be removed and secured in the compartments, together with necessary hardware: the door to the passage area aft of the ramp winch compartment on the port side; the door to the passage area directly opposite on the starboard side; and the door to the storeroom on the starboard side. Blanks of No. 18 gage galvanized sheet metal with flanged holes for attaching the air ducts, will be applied over the doorways. The blanks will be secured to the bulkhead with clips riveted to the blanks, by tack welding at the corners, or by other suitable means. A dry air duct will be run from the dehumidification machine and attached to the pipe which penetrates the bulkhead of the ramp winch compartment. The pipe cap will be removed and stowed within the compartment. A branch duct will be run from this line to the flanged hole in the blank covering the portside passage area doorway.

2. *Ducts to zone 2.* To permit circulation of air within zone 2, the hatch cover will be removed from the hatch opening to the messroom, and the window will be removed from the starboard door of the pilothouse. The resultant openings will be covered with ferrous metal blanks constructed and equipped with fittings in accordance with figure 16. A dry air duct will be run from the dehumidification machine to the short fitting on the blank applied over the messroom hatch. A branch duct will be run to a fitting in the plate attached to the window opening in the pilot house door. A connecting duct will be run, from the other fitting in the plate, to an opening in the anchor winch cover. A return moist air duct will be run from the anchor winch cover and will be joined by a T-connection to a return line running from the long fitting in the hatch cover plate to the dehumidification machine. Two lengths of flexible tubing of 4 inch inner diameter will be attached to the Y-fitting on the underside of the hatch cover plate. One length of the flexible tubing will extend downward into the port generator room. The other length will extend downward into the starboard generator room.

(c) *Humidistats.* A hair type humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within each zone being dehumidified. The humidistats will be wired to the dehumidification machines by means of No. 18, two conductor, rubber-covered cables. The humidistat in zone 1 will be secured approximately 3 feet above the deck on the outboard bulkhead of the storeroom from which the return air duct is run to the dehumidification machine. The humidistat in zone 2 will be secured in the starboard engine room, near the access to the starboard generator room, approximately 3 feet above the deck.

(d) *Sensing elements.* In zone 1, humidity sensing elements without cable will be installed in the sheet metal blanks used to cover the doorways to the storeroom and passage area on the starboard side of the craft. In zone 2, humidity sensing elements without cable will be installed in the port side of the winch cover and in the cover over the natural exhaust opening in the well deck bulkhead under the poop deck. A humidity sensing element with 6 foot cable will be installed in the pilot house. The mounting assembly will be installed in the blank over the window in the starboard door and the element will be suspended near the wheel.

(5) *Ventilation of spaces not under dehumidification.* Provision will be made for ventilation of all spaces not under dehumidification. The door between compartments in the hold, all manholes and handhole covers will be secured in open position. Existing ventilators and vent pipes will be left open. Where deck plates or accesses are used to furnish ventilation, they will be fitted with covers to permit entry of air but to exclude direct entry of water. Galvanized gooseneck vents will be fitted to deck plates and other small openings. All vents will be provided with insect screens.

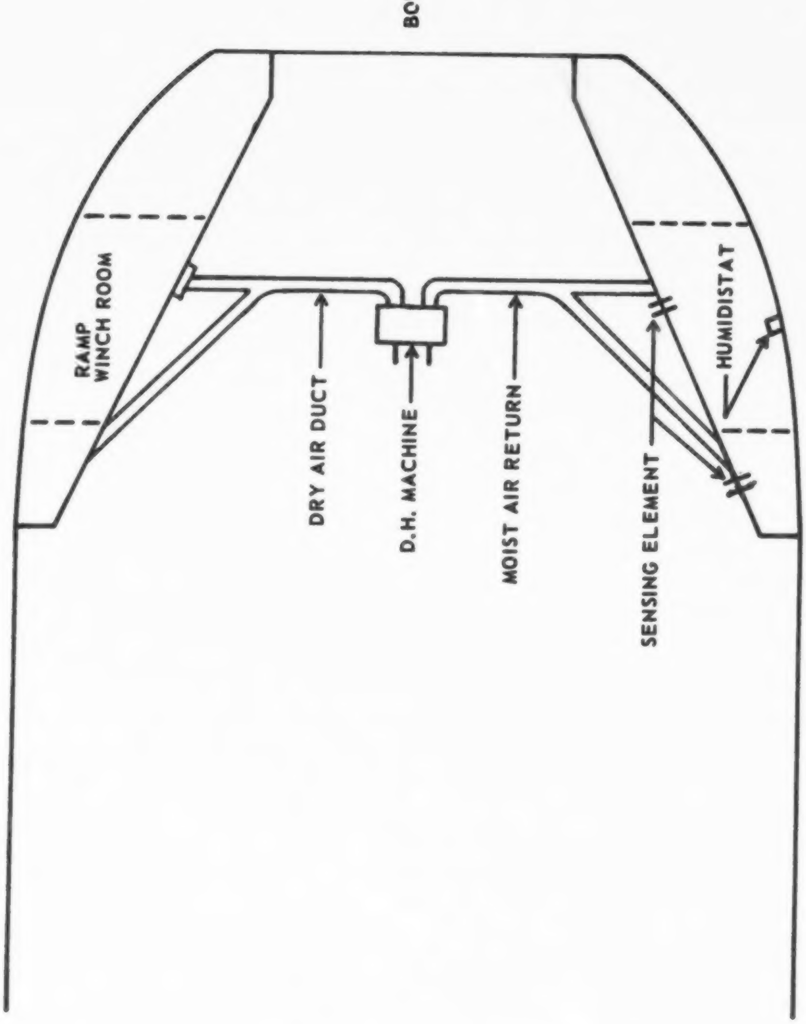


Figure 13. Dehumidification piping zone 1 (BOW) of LCU.

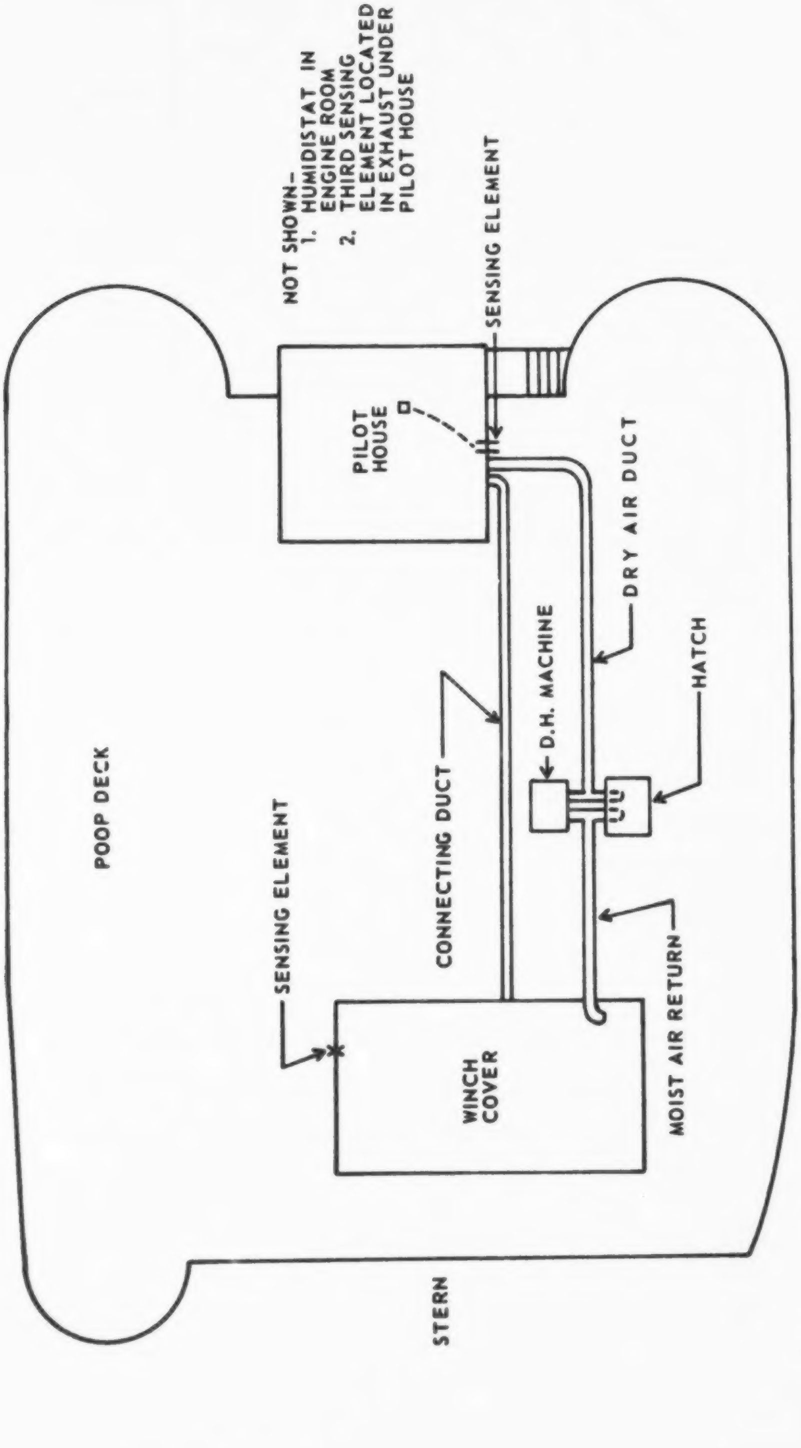
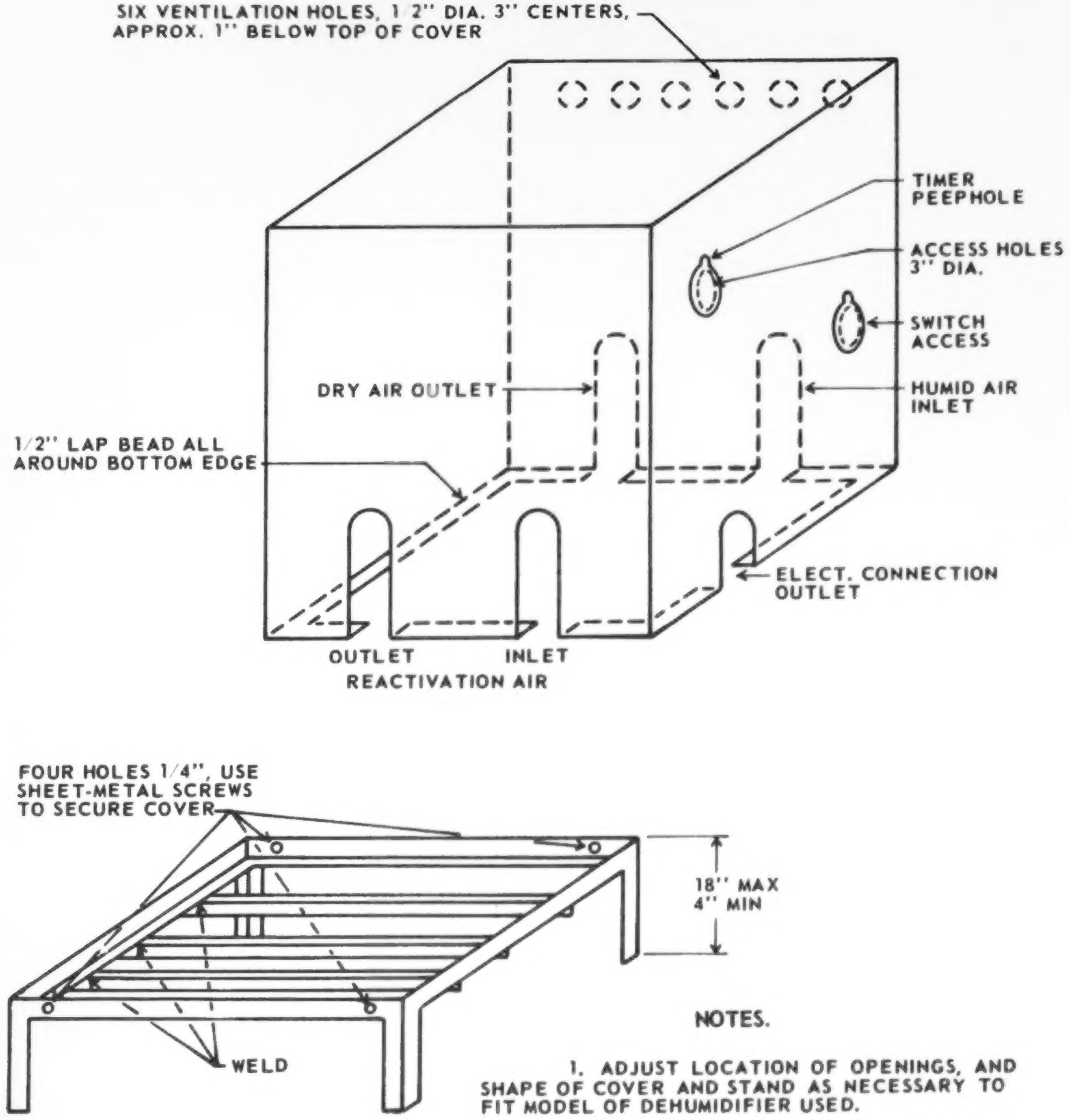


Figure 14. Dehumidification piping zone 2 (STERN) of LCU.


SIX VENTILATION HOLES, 1/2" DIA. 3" CENTERS, APPROX. 1" BELOW TOP OF COVER
TIMER PEEPHOLE
ACCESS HOLES 3" DIA.
SWITCH ACCESS
DRY AIR OUTLET
HUMID AIR INLET
1/2" LAP BEAD ALL AROUND BOTTOM EDGE
ELECT. CONNECTION OUTLET
OUTLET
INLET
REACTIVATION AIR
FOUR HOLES 1/4", USE SHEET-METAL SCREWS TO SECURE COVER
18" MAX
4" MIN
WELD

NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 15. Typical cover and stand for dehumidifier.

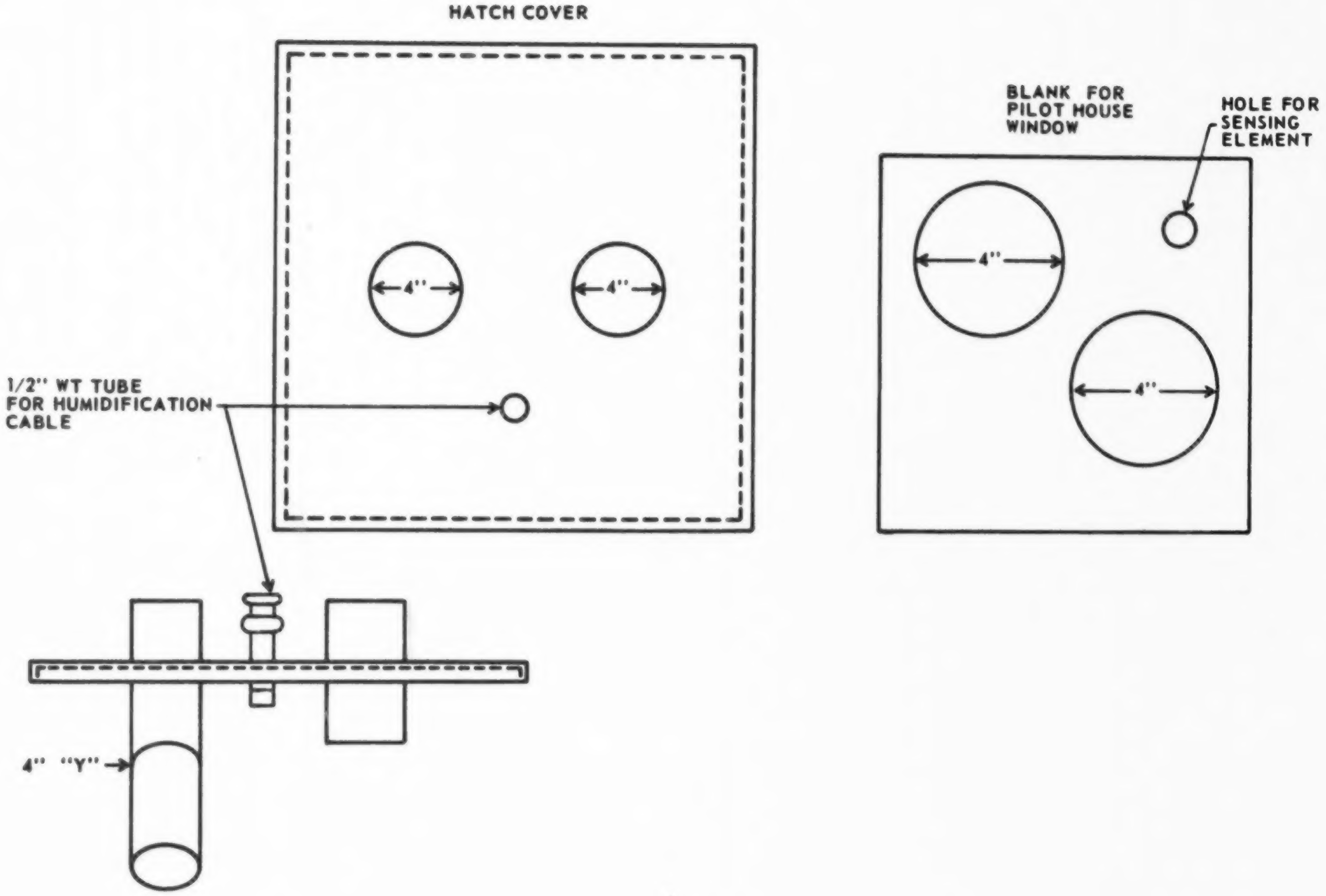

HATCH COVER
4"
4"
1/2" WT TUBE FOR HUMIDIFICATION CABLE
4" "Y"
BLANK FOR PILOT HOUSE WINDOW
HOLE FOR SENSING ELEMENT
4"
4"

Figure 16. Blanks for dehumidification piping for LCU.

APPENDIX E
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR TUG, HARBOR, DIESEL, 200 HP, STEEL, 45 FOOT, DESIGN 320

1. General. This appendix provides detailed instructions for preparation of the harbor tug, design 320, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Pilothouse.* The following items will be removed, identified and stored in the pilothouse:

(a) Windshield wiper.

(b) Life raft.

(c) Life ring.

(d) Horn.

(e) All exterior lights with plug-type connections.

(f) Bell.

(2) *Crew quarters.* The following items will be removed, identified, and stowed in the crew quarters:

(a) Canvas covers.

(b) Anchor windlass and handle.

(c) Fire hose and nozzle.

(d) Portable davit and falls.

(e) Halyards.

(f) Vent cowls.

(g) Port light screens.

(h) All deck keys and dog wrenches.

(3) *Rope locker.* The anchor rope will be detached from the anchor and stowed in the rope locker.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The entire tug will be prepared for dehumidification. The mid-ship section, including the engine room, pilothouse, and crew quarters, will be prepared for dynamic dehumidification. The lazaret and forepeak compartments will be preserved by a combination of static and dynamic dehumidification. Dry air will enter these compartments through the open sluice valves and in addition, sufficient bagged desiccant, conforming to MIL Spec D-3464, to maintain relative humidity of 40 percent will be secured in each compartment.

(2) *Provisions for air circulation.* The door between the engine room and the crew quarters will be secured in open position. The hatch cover will be removed from the hatch in the pilothouse seat. All dampers in the ventilation system will be turned to open position. The valves leading from the forepeak area and the lazaret will be turned to open position.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are as follows:

(a) Dehumidified area. Edges of doors, portlights, windows, hatch covers and all other openings in the nature of seams or joints between closely opposed surfaces which give access to dehumidified areas will be sealed with strippable coating and bituminous coating. When sealing portlights, the strippable coating will be extended outward over adjacent surfaces of the bulkheads.

(b) Stack. All openings to the stack will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(c) Air supply openings. The supply openings for the mechanical ventilation system, which is located on the aft bulkhead of the house, will be sealed as specified for stack openings.

(d) Exterior valves, vents, fills and discharges. All vents, fill and discharge openings located on decks, will be sealed with strippable coating and bituminous coating. If necessary to attain the required air tightness, all exterior valves will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(e) Hull openings. All exterior hull openings leading to dehumidified areas of the vessel will be closed with caps, plugs, blanks or pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(f) Hatches. The perimeters of the hatches over the engine room and crew quarters will be sealed by troweling bituminous coating into the aperture between the coaming and the closed cover. Recesses in the covers will be masked with pressure-sensitive tape. The tape and all joints around the operating mechanism and dogs will be

sealed with strippable coating and bituminous coating.

(g) Manholes. Manholes to the forepeak and lazaret will be sealed with strippable coating and bituminous coating.

(h) Hawse pipe hole and windlass mounting holes. The hole through which the anchor rope is fed into the rope locker, and the tapped holes for windlass mounting screws will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(i) Miscellaneous sealing. Window drain holes and openings resulting from removal of windshield wipers, horn, and searchlight will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(j) Dehumidification piping system. The connecting points of all air tubing or ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the tubing or ducts. All joints in the tubing and ducts will be similarly sealed.

(k) Fuel oil valve extension rods. Fuel oil emergency shutoff extension rods, which project through the deck, will be turned to full open position and the rod and adjacent deck will be coated with strippable coating.

(4) *Dehumidification installation.*

(a) Dehumidification machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic feet capacity, 110-volt, ac, will be installed as shown on figure 17. The machine will be mounted on a stand and protected with a cover fabricated in accordance with figure 18. One machine will service two tugs.

(b) Duct installation for dry storage. Four-inch diameter No. 26 gage, galvanized tubing, with necessary ells, reducing fittings, and connections, will be installed generally as shown on figure 17. Blanks of galvanized metal or of ½-inch thick exterior grade plywood will be used for joining the duct work to the portlights. The blanks will have suitable holes for insertion of the ducts. Holes for mounting sensing element assemblies and for insertion of the humidistat cable will also be provided as shown on figure 17. The blanks will be secured with sufficient hook bolts to hold them snug against the portlight frames.

(c) Duct installation for wet storage. For wet storage, the duct installation will be the same as specified for dry storage except that the connecting ducts between tugs will be flexible hose and the hose will be at least 4 feet longer than the distance between terminal connections.

(d) Duct extension. Flexible hose will be used to extend the ducts into the crew quarters of the tug, on which the dehumidification machine is mounted, and into the engine room of the other tug serviced by the dehumidification machine, as indicated on figure 17. The flexible hose will extend to within approximately 2 feet of the deck of the compartment in which it is placed.

(e) Machine connections. Connection of ducts to the dehumidification machine will be made with unions or slip joint connections which permit easy removal of the machine for servicing.

(f) Humidistat. A hair type humidistat will be installed in the engine room of the tug remotely serviced by the dehumidification machine as shown in figure 17. The humidistat will be attached approximately 3 feet above floor plate level to the stanchion located approximately 6 feet forward of the aft bulkhead on the port side of the tug. The humidistat will be wired to the dehumidification machine with No. 18 2-conductor rubber-covered cable with suitable terminal connectors.

(g) Sensing elements. Humidity sensing elements will be installed as follows:

1. Engine room. A humidity sensing element with 6 foot cable will be mounted in each blank used to connect the duct work to the portlights of the engine room. The element and cable will be extended into the engine room and secured approximately 2 feet above the engine room floor.

2. Pilothouse. A humidity sensing element, without cable, will be installed in the pilothouse door of each tug, as shown on figure 17. Mounting will be accomplished by removing one dog at the center of the hinged side of each door and mounting the element in the hole.

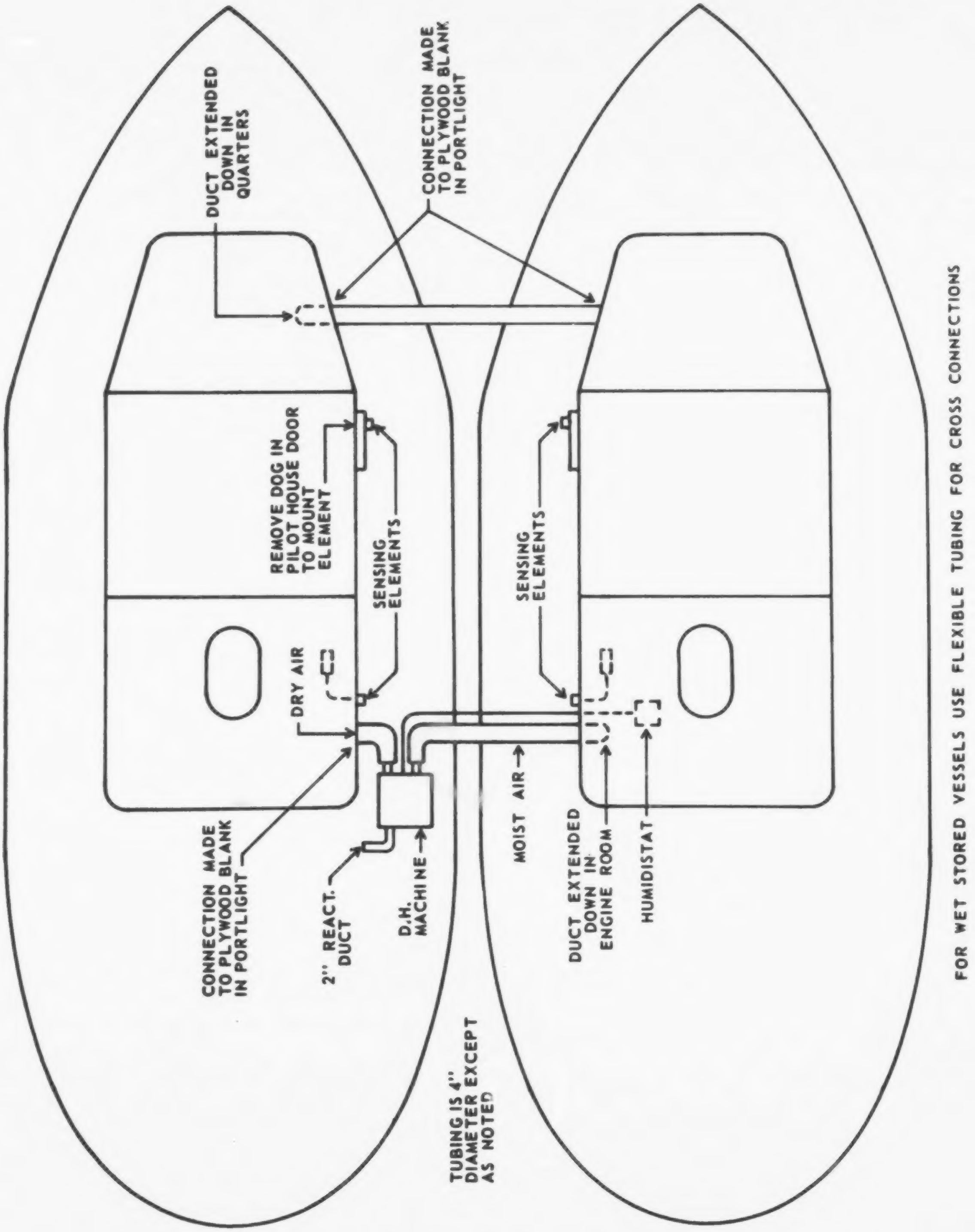
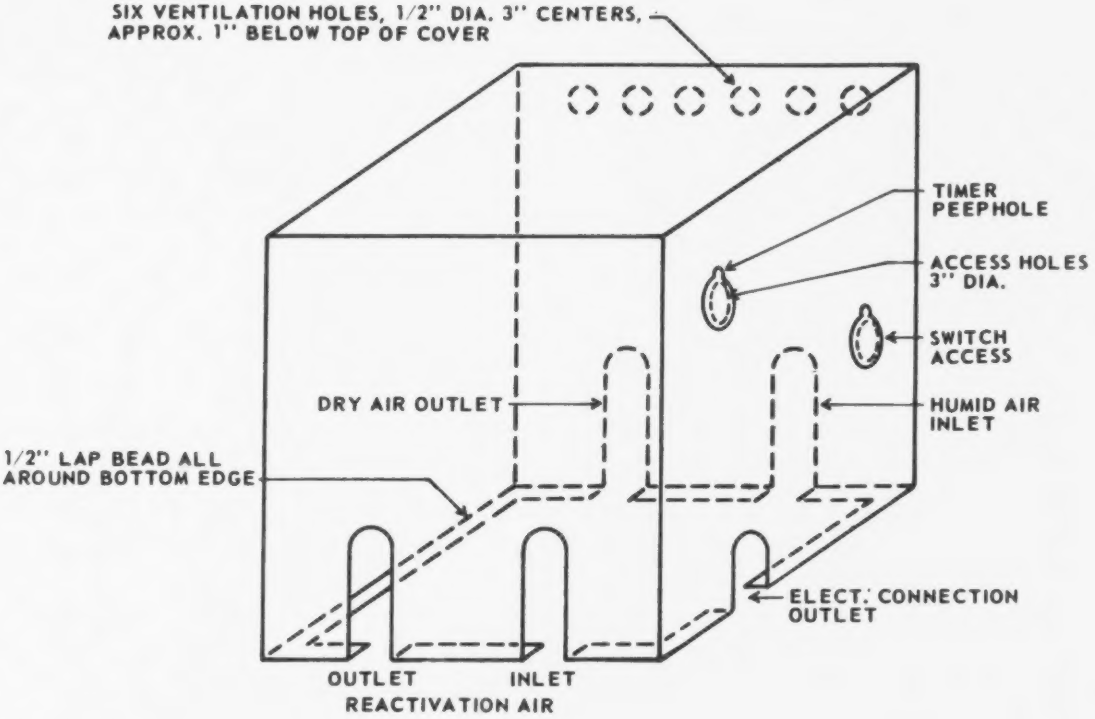
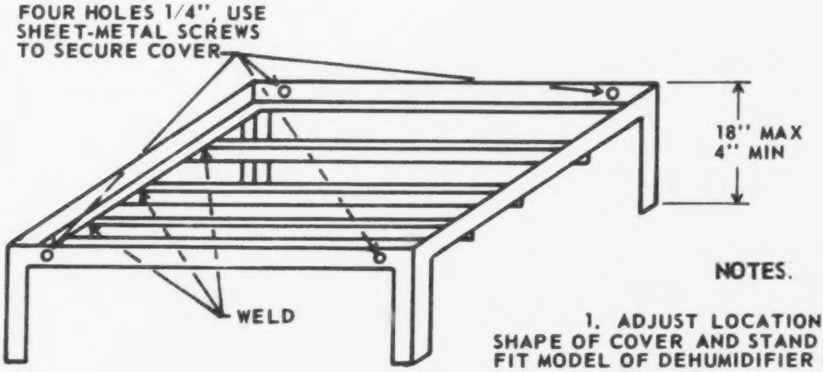

DUCT EXTENDED DOWN IN QUARTERS
CONNECTION MADE TO PLYWOOD BLANK IN PORTLIGHT
REMOVE DOG IN PILOT HOUSE DOOR TO MOUNT ELEMENT
SENSING ELEMENTS
SENSING ELEMENTS
DRY AIR
CONNECTION MADE TO PLYWOOD BLANK IN PORTLIGHT
2'' REACT. DUCT
D.H. MACHINE
MOIST AIR
DUCT EXTENDED DOWN IN ENGINE ROOM
HUMIDISTAT
TUBING IS 4'' DIAMETER EXCEPT AS NOTED
FOR WET STORED VESSELS USE FLEXIBLE TUBING FOR CROSS CONNECTIONS

Figure 17. D. H. piping for tug design 320.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 18. Typical cover and stand for dehumidifier.

APPENDIX F
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR TUG, HARBOR, DIESEL, 600 HP, STEEL, 65 FOOT, DESIGN 3004

1. General. This appendix provides detailed instructions for preparation of the harbor tug, design 3004, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Pilothouse.* The following items will be removed, identified, and stowed in the pilothouse:

(a) Air whistle.
(b) Horn.
(c) All exterior lights with plug-type connections.

(2) *Stores flat.* The following items will be removed, identified, and stewed in the stores flat:

(a) All canvas covers.
(b) Rain shields.
(c) Falls and halyards.
(d) Stern quadrant gratings (wood).
(e) Pilothouse floor grating.
(f) Portable davit.

(3) *Crew's quarters.* The following items will be renewed, identified, and stowed in the crew's quarters.

(a) Salvage hose.
(b) Shower curtain and hooks.

(4) *Fidley.* The following items will be removed, identified, and stowed in the fidley:

(a) Life rafts.
(b) Life raft chocks and gripes.
(c) Jackstaff.
(d) Portlight screens.
(e) Monitor barrel.
(f) Monitor nozzles.
(g) Deck keys and dog wrenches (all).
(h) Sand shovel.
(i) Spanner wrenches for fire stations.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* All areas of the craft, except the forepeak ballast tank, the boatswain's locker, the deck and cleaning gear locker, the aft ballast tank, the hauser stores flat, and void areas aft of the engine room, will be prepared for dynamic dehumidification. The anchor windlass will be included among the areas to be dehumidified. All areas being dehumidified will be treated as a single zone.

(2) *Provisions for air circulation.* Within the zone being dehumidified, all interior doors will be secured in an open position. The galley range and refrigerator doors will be secured in an open position. Galley range smokepipe will be removed and secured nearby. In the pilothouse, the cover will be removed from the aft face of the remote control stand and secured nearby. Doors will be secured open, and cover sections loosened or removed from the switch which can be ventilated without disturbing electrical connections. The damper on the aft face of the fan room will be turned to "summer position." All other dampers in the ventilating system will be turned to open position. The cooling water pipe will be detached at the stern tube connection, and the opening to the stern tube closed with a pipe plug. Clean-out covers or plugs will be removed from the engine manifold and secured adjacent to the openings. The flexible connection will be removed from the exhaust line and secured nearby. Connections to the air tank and the manually operated control valve will be broken and left open for ventilation. All drain plugs in the control system will be removed, bagged, tagged, and secured adjacent to their proper locations.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are as follows:

(a) Stack. All openings at the top of the stack will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(b) Exhaust vents on fidley. All openings to covers of exhaust vents on the fidley will be sealed as specified for the stack.

(c) Fidley. The stagger welds and gasketed joint around the fidley will be sealed with strippable coating and bituminous coating.

(d) Skylights on fidley. The edges of the skylight glasses and frames will be sealed with strippable coating and bituminous coating.

(e) Pilothouse. Edges of doors and windows (except the one used for introduction of dry air as

shown on figures 19 and 20) will be sealed with strippable coating and bituminous coating. Keyholes and small openings resulting from removal of windshield wiper and other items will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating. Window drains will be sealed in the same manner, or fitted with pipe plugs.

(f)Fanroom. The metal covers will be installed over the louvered openings to the fanroom (except the two openings to be used in the dehumidification system as shown on figures 19 and 20). The edges of the installed covers will be sealed with strippable coating and bituminous coating. The damper handle will be sealed in the same manner.

(g) Fill, vent and discharge lines. All valves, mains, vents, overflow and discharge lines on decks and on the exterior of the hull above the waterline will be closed and sealed with strippable coating and bituminous coating.

(h) Scuttle to crew's quarters. The scuttle to the crew's quarters will be sealed by troweling bituminous coating into the aperture between the coaming and the closed cover. The recess in the center of the cover will be masked with pressure-sensitive tape and sealed with strippable coating.

(i) Windlass cover. A cover will be fabricated and installed over the entire anchor windlass. The cover will be made of No. 18 gage galvanized sheet metal, with welded or soldered seams. The top will be slanted approximately ½-inch per foot downward toward the motor end of the winch. A coaming of 1 x 1/8-inch angle iron will be tack welded to the deck around the winch. The angle irons will be positioned with one face against the deck and the vertical face toward the windlass. The size and shape of the coaming will be such that the sheet metal cover fits snugly over the vertical faces. The sheet metal cover will be fastened to the coaming by two No. 12 sheet metal screws through each long face. The screws will be spaced approximately 18 inches from the ends. The cover will be provided with openings for application of an air duct and a sensing element as shown on figure 20. Apertures between the coaming and the deck will be filled with bituminous coating. All joints and seams will be sealed with strippable coating and bituminous coating.

(j) Windlass speed control box. The openings around the wires at the base of the box and the operating handle extension through the box will be sealed with strippable coating and bituminous coating. The openings may first be filled with a packing or sealed with tape to facilitate bridging with strippable coating. Five units of bagged desiccant conforming to MIL Spec D-3464 will be distributed within the box, and cover closed immediately and sealed with strippable coating. The cover will be stenciled "DESICCANT INSERTED (Month) (Year)."

(k) Capstan. All openings above the deck to the interior of the capstan will be sealed with strippable coating and bituminous coating.

(l) Exterior doors and portlights. All exterior doors, except those to the boatswain's locker and the cleaning gear locker, will be sealed as specified for pilothouse doors. Strippable coating will be applied over the exterior of the portlight frames and outward over adjacent surfaces of the bulkhead in a manner to prevent entry of water into the recess outside the portlight.

(m) Dehumidification piping system. The connecting points of all air tubing or ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the tubing or ducts. All joints in the tubing and ducts will be similarly sealed.

(n) Capstan master switch. All openings above the deck to the interior of the switch housing will be sealed as specified for the capstan.

(o) Galley range fuel oil valve extension rod. The galley range fuel oil emergency shut-off extension rod, which projects through the bulkhead, will be turned to full open position, and the rod and adjacent bulkhead will be coated with strippable coating.

(4) *Dehumidification installation.*

(a) Dehumidification machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic feet, 110-volt, alternating current, will be installed. The machine, with a cover and stand fabricated in accordance with figure 21, will be mounted on the main deck near the aft port corner of the deckhouse as shown on figure 20.

(b) Duct installation. Galvanized tubing, 4-inch diameter, No. 26 gage, with necessary ells, tees, reducing fittings, and connections will be installed generally as shown on figures 19 and 20. Ductwork will be supported on 2 x 4-inch wood stanchions. The ducts will be fastened to the stanchions by galvanized strapping.

(c) Dry air lines. Dry air lines will be run to the anchor windlass cover, to the window farthest to port on the aft face of the pilothouse, and to the louvered opening farthest to port on the aft face of the fanroom. Flanges of exterior grade plywood or

galvanized sheet metal will be fitted into the window space and over the louvered openings, and the ducts fitted securely into the flanges.

(d) Moist air return lines. Moist air return lines will be run to louvered opening on the starboard side of the fanroom and to the scuttle leading from the engine room to the main deck. The scuttle will be secured in open position. The operating mechanism will be removed from the scuttle cover and secured at the base of the engine room ladder to the scuttle. Flanges of exterior grade plywood or galvanized sheet metal will be fitted over the louvered opening to the fanroom and over the scuttle. The ducts will be fitted securely into the flanges.

(e) Humidistat. A hair type humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified areas. The humidistat will be installed in the engine room. The humidistat will be placed approximately 3 feet above the floor plate level of the engine room. It will be attached to a stanchion which is located approximately 6 feet forward of the aft bulkhead of the engine room. The humidistat will be connected to the dehumidification machine by means of a No. 18, two conductor, rubber-covered cable run through an opening in the flange fitted over the engine room scuttle.

(f) Sensing elements. Humidity sensing elements will be installed as follows:

1. Pilothouse. A humidity sensing element with 6 foot cable will be placed in the pilothouse, with the mounting assembly installed through the flange to which the dry air duct is attached and with the sensing element suspended approximately 3 feet above the deck in the vicinity of the steering wheel.

2. Engine room. A sensing element, identical to that specified for the pilothouse, will be placed in the engine room. The mounting assembly will be installed through the flange attached to the scuttle, and the sensing element will be tied to the ladder in a manner to hang clear at approximately 3 feet above the floorplate.

3. Windlass cover. A humidity sensing element, without cable, will be installed in the starboard side of the sheet metal cover over the windlass, approximately 30 inches above the deck.

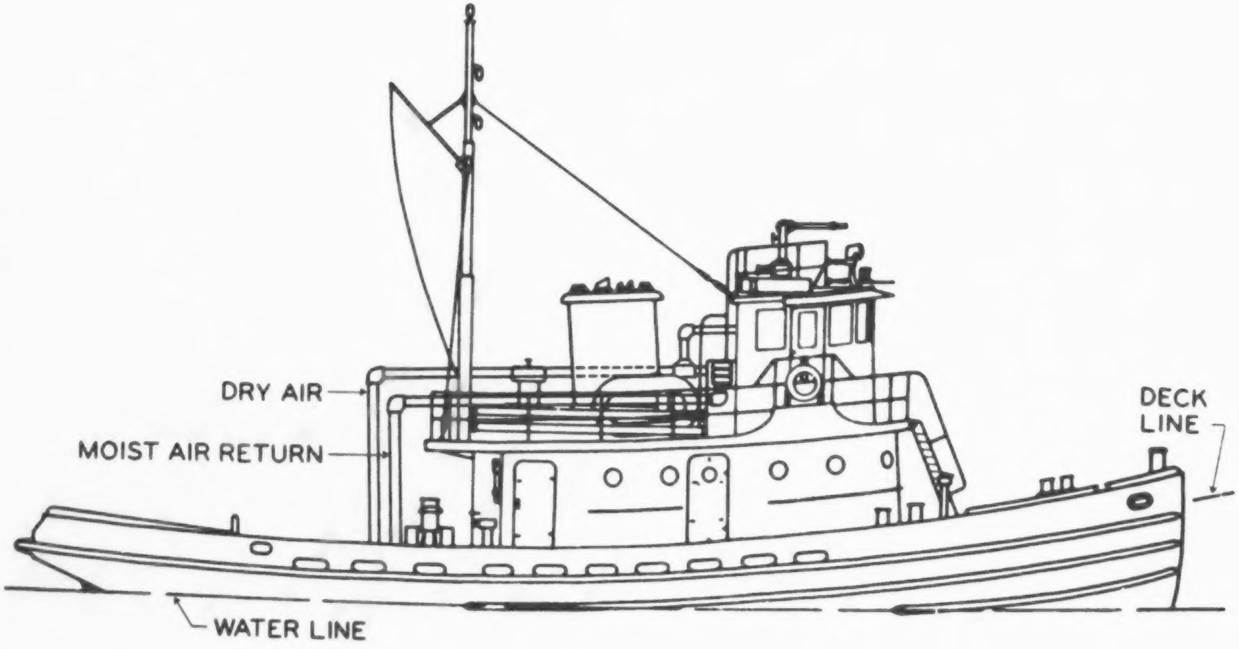


Figure 19. D. H. piping for tug design 3004.

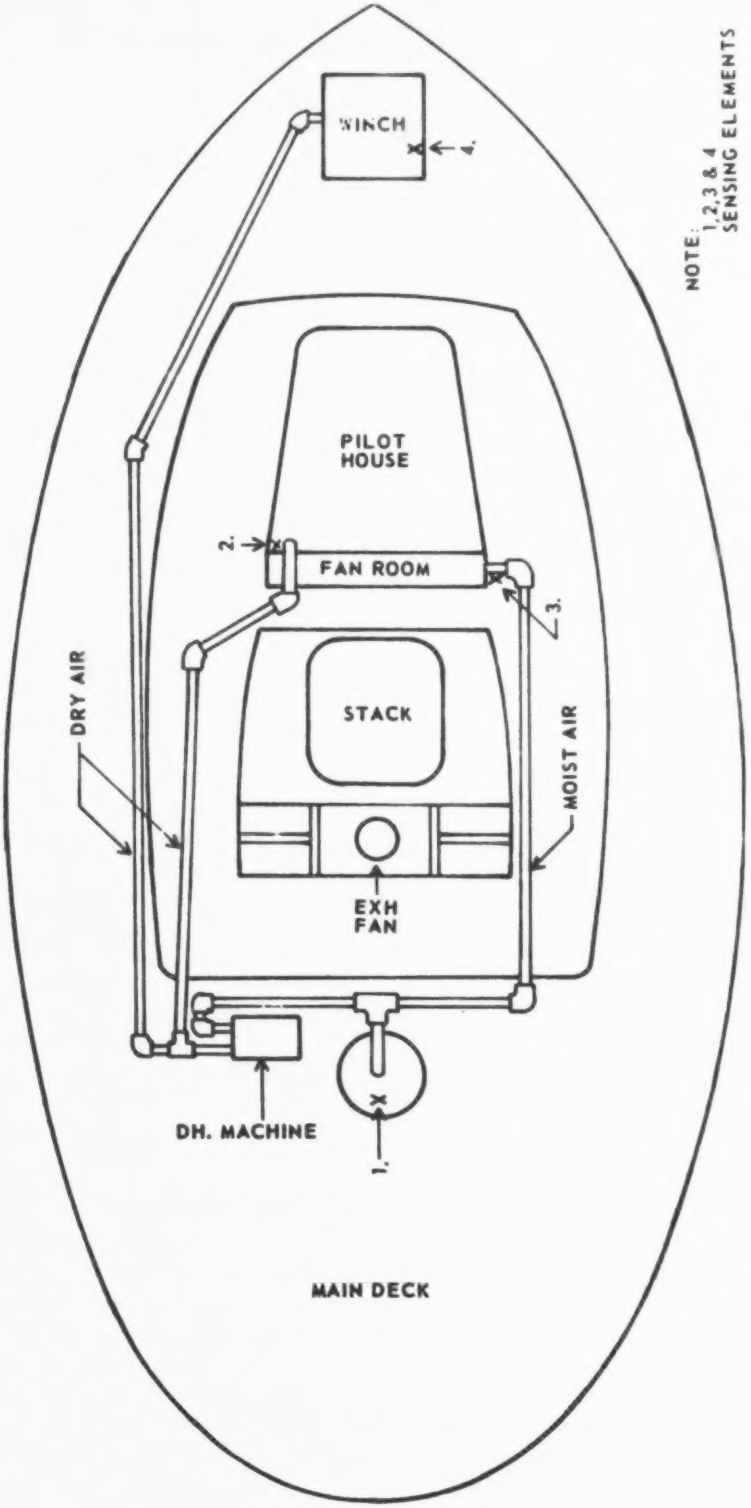
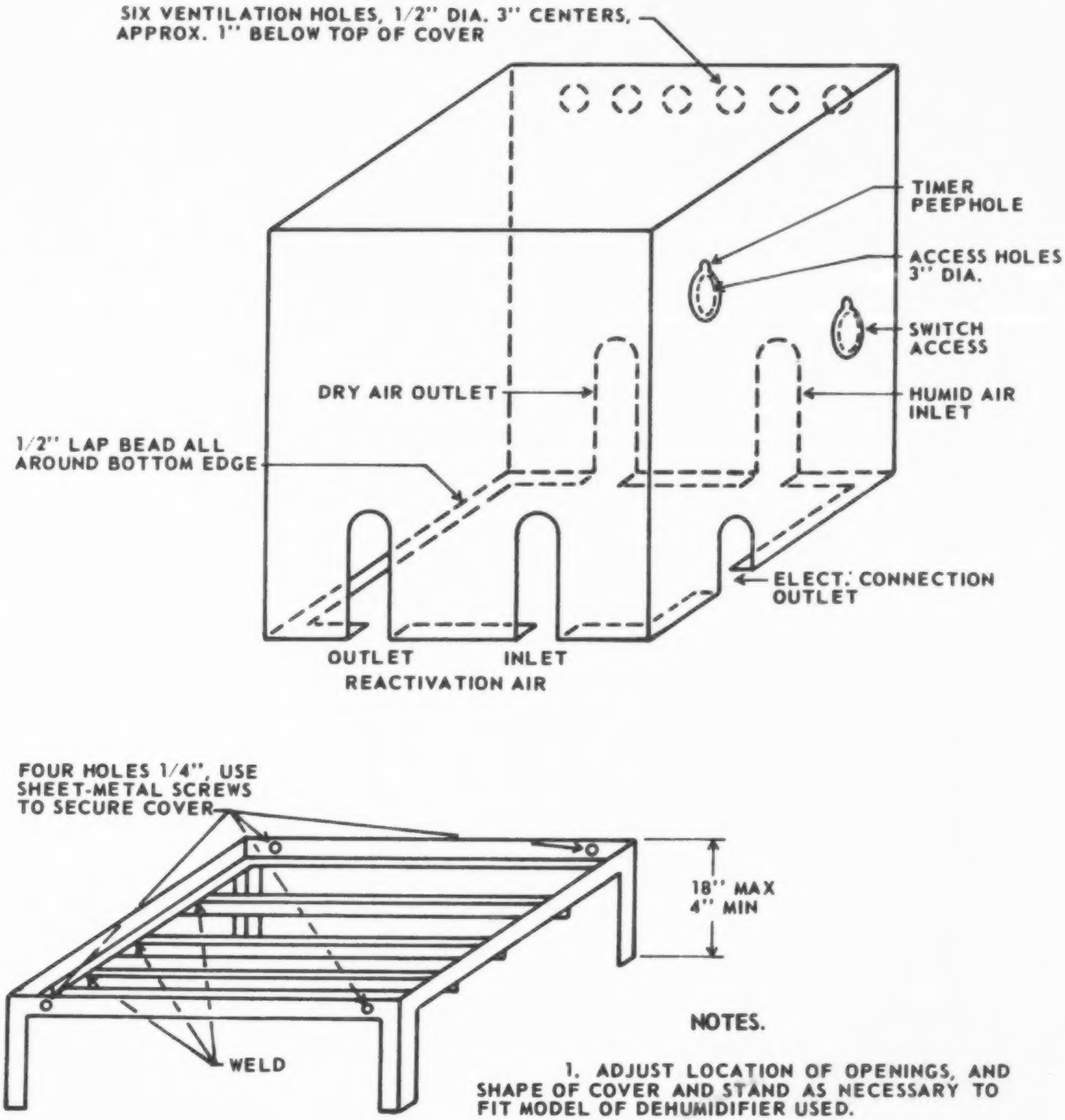


Figure 20. Dehumidification piping for tug design 3004.


SIX VENTILATION HOLES, 1/2" DIA. 3" CENTERS, APPROX. 1" BELOW TOP OF COVER
TIMER PEEPHOLE
ACCESS HOLES 3" DIA.
SWITCH ACCESS
DRY AIR OUTLET
HUMID AIR INLET
1/2" LAP BEAD ALL AROUND BOTTOM EDGE
ELECT. CONNECTION OUTLET
OUTLET
INLET
REACTIVATION AIR
FOUR HOLES 1/4", USE SHEET-METAL SCREWS TO SECURE COVER
18" MAX
4" MIN
WELD

NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 21. Typical cover and stand for dehumidifier.

APPENDIX G
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR TUG, HARBOR, DIESEL, 1,200 HP, STEEL, 100 FOOT, DESIGN 3006

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1. General. This appendix provides detailed instructions for preparation of the harbor tug, design 3006, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Pilothouse.* The following items will be removed, identified, and stowed in the pilothouse:

(a) Pelorus stand.

(b) Blinker light and key.

(c) Rudder angle indicator.

(d) Jackstaff and anchor light staff.

(e) Ships bell and bracket.

(f) Windshield wipers.

(g) Navigation lights.

(h) Searchlight.

(i) Halyards.

(j) Horn, air whistle and lanyard.

(k) Main deck fire station valves and fittings.

(l) Skylight glass (1).

(2) *Crew quarters.* The following items will be removed, identified, and stowed in the crew quarters:

(a) All canvas covers, curtains, and dodgers.

(b) Lifeboat falls and equipment.

(c) Scuttle and deckplate keys, and dog wrenches.

(d) Fire monitors and valves.

(e) Salvage hose.

(f) Gratings from aft end of main deck.

(3) *Lifeboat.* The lifeboat will be inverted and stowed on supports of sufficient height to hold the boat clear of the deck. The supports will be distributed to minimize stresses on the boat. The gripes will be used to hold the lifeboat in position.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The entire interior of the tug will be prepared for dynamic dehumidification.

(2) *Provisions for air circulation.* To permit maximum circulation of air within the dehumidified zone, all interior doors, including the door from the engine room to the shaft alley, cabinet doors, panel and controller doors, refrigerator doors and doors on similar items, will be secured in open position. All manhole covers will be removed and secured in other than normal position. The engine room escape hatch and the hatch between the stores compartment and the shaft alley will be secured in open position. Valves in the bilge suction line, from all tanks, voids, and compartments and the bilge manifold valves will be opened. Ventilation systems will be in open position. The cover of the hydraulic ram will be provided with two holes of sufficient size for introducing dehumidification ductwork. If the cover has been provided with inspection accesses, they will be used instead of cutting new holes. Piping will be disconnected at the air starting tank and at the air valves. All air valves will be left in open position. The drain plugs and inspection plates will be removed from the exhaust manifold and secured adjacent to the openings. Soot pots will be removed, cleaned, and secured adjacent to places of removal. The inspection plate on the galley range smokepipe, passing through the engine room casing, will be removed and secured to the smokepipe.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are as follows:

(a) Crew quarters scuttle. The scuttle to the quarters will be sealed by troweling bituminous coating into the aperture between the coaming and the closed cover. The recess in the cover will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(b) Davit winch. The opening at the top of the slewing bearing will be sealed with strippable and bituminous coating to prevent infiltration of water.

(c) Capstan and windlass controls. All openings on the capstan and windlass control boxes will be sealed with strippable coating and bituminous coating. The joints between the control pedestals

and the deck will be sealed in a similar manner.

(d) Capstan. The opening between the capstan head and the capstan pedestal and the joint at the pedestal and the deck will be sealed with strippable coating and bituminous coating.

(e) Tank vents, fills and discharges. All tank vents and all fill and discharge openings located on deck will be sealed with strippable coating and bituminous coating.

(f) Fire monitors. The openings resulting from removal of the three fire monitors and valves will be blanked and sealed with strippable coating and bituminous coating. The blank on the portside boat deck will be provided with a hole of sufficient size to introduce the moist air return duct.

(g) Stack. The louvered section and the openings at the top of the stack will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating. The joint between the stack cover and the rim of the stack will be sealed with strippable coating. The exhaust stacks protruding from the stack cover will be blanked and sealed with strippable coating and bituminous coating. The door in the stack will be sealed with strippable coating and bituminous coating. All other seams or openings in the stack which might affect the air tightness will be sealed in a similar manner.

(h) Gooseneck and mushroom vents. Goosenecks and mushroom vents will be sealed with strippable coating and bituminous coating.

(i) Voice tubes. The mouthpiece covers on the voice tubes, located on the emergency steering station, will be sealed with strippable coating and bituminous coating.

(j) Skylight. The opening resulting from removal of the aft skylight glass on the portside will be blanked with a galvanized sheet metal or exterior grade plywood blank provided with a hole of sufficient size to introduce the dehumidification system dry air duct. The blank and the remaining skylight glasses and frames will be sealed at the edges with strippable coating and bituminous coating. The skylight will be closed and the joint between the skylight base and the movable sections will be sealed with strippable coating and bituminous coating. The joint at the skylight base and the boat deck will be similarly sealed.

(k) Fidley. The stagger welds and gasketed joint around the fidley will be sealed with strippable coating and bituminous coating.

(l) Exterior doors, windows, and portlights. The edges of the exterior doors, pilothouse windows, and portlights, except those used to introduce dehumidification ductwork, humidistat cable or sensing element contacts, will be sealed with strippable coating and bituminous coating. When sealing the portlights, the strippable coating will be extended outward over the adjacent surfaces of the bulkheads.

(m) Louvered openings. The louvered opening in the door to the fanroom aft of the pilothouse will be covered with a galvanized sheet metal or plywood blank. The blank will be secured over the louvers. The perimeters of the blank and of the door will be sealed with strippable coating and bituminous coating. The louvered opening to the fanroom at frame No. 37 will be covered with the installed cover and the perimeter of the cover sealed with strippable coating and bituminous coating.

(n) Steering cable guide tube. The steering cable guide tube will be sealed at the stern end of the tube with strippable coating and bituminous coating. The seal will extend around the cable and the tube opening and will overlap both for a distance of 2 inches.

(o) Stern tube cooling water connection. The cooling water pipe will be detached at the stern tube connection and the opening to the stern tube closed with a plug or a cap. The threads will be coated with pipe thread compound.

(p) Fire stations. The openings resulting from removal of the port and starboard fire station valves and fittings above the first flange on the main deck will be blanked with galvanized sheet metal or exterior grade plywood blanks. The blank on the portside line will be provided with a hole for the passage of the humidistat cable. The blank on the starboard line will be provided with a hole for mounting the sensing element contact.

(q) Fire and salvage line blanks. The fire and salvage line blanks will be sealed with strippable coating and bituminous coating.

(r) Engine order telegraph. The engine order telegraph on the lifeboat deck will be sealed with strippable coating and bituminous coating. The junction of the pedestal and the deck will be similarly sealed.

(s) Windlass cover. A cover will be fabricated and installed over the anchor windlass, the blanked hawse pipe openings, and the forepeak access. The cover will be fabricated from minimum No. 18 gage galvanized sheet metal. All top and vertical edges will be reinforced by 1 x 1 x 1/8-inch angle irons. A coaming of 1 x 1/8-inch angle iron will be tack welded to the deck around the windlass. The angle irons will be positioned with one face against the deck and the vertical face toward the windlass. The size and shape of the coaming will be

such that the sheet metal cover fits snugly over the vertical faces. The cover will be fastened to the coaming by No. 12 sheet metal screws spaced approximately 2 feet apart. The cover will be provided with three holes: one to introduce the moist air return duct; another for the humidistat cable; and the third for mounting the sensing element. Apertures between the coaming and the deck will be filled with bituminous coating. All other joints and seams will be covered with strippable coating and bituminous coating.

(t) Dehumidification piping system. The connecting points of all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapter, and other devices used to attach or introduce the ducts. All joints and seams in the ducts will be similarly sealed.

(u) Miscellaneous sealing. Window drain holes and openings resulting from removal of windshield wipers, horn, searchlights, and other such items will be sealed with strippable coating. All other exterior openings that led to dehumidified areas and not specified herein will be sealed with strippable coating and bituminous coating.

(4) *Dehumidification installation.*

(a) Dehumidification machine No. 1. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating current will be installed generally as shown on figure 22. The machine will be mounted on a stand and protected with a cover fabricated in accordance with figure 24. An extension, terminating in a 90° elbow, will be fitted to the reactivation air outlet on the dehumidification machine in order to extend the outlet beyond the exterior side of the sheet metal cover. The elbow will be turned away from the reactivation air inlet side and turned downward 45° to prevent the direct entry of water.

(b) Duct installation No. 1. Four-inch diameter, No. 26 gage galvanized sheet metal ducts with necessary ells, reducing fittings and connections will be installed generally as shown on figure 22. A pilothouse window will be secured in open position and the opening will be blanked with galvanized sheet metal or exterior grade plywood. The blank will be provided with a hole of sufficient size to permit the introduction of the dry air duct. The blank will be secured in the window and sealed with strippable coating and bituminous coating. The ductwork will be run up the stairway from the main deck to the pilothouse. A duct will be run from the anchor windlass cover to the moist air return connection on the dehumidification machine.

(c) Dehumidification machine No. 2. A dehumidification machine, similar to that described in (a) above and with a similar stand and cover, will be installed generally as shown on figure 23.

(d) Duct installation No. 2. Ductwork, of a similar type and size and with similar fittings and connections as they described in (b) above, will be installed generally as shown on figure 23. The dry air duct will be introduced into the hole provided in the blank on the skylight. The moist air return duct will be run from the blank on the portside aft fire monitor to the dehumidification machine.

(e) Dehumidification machine No. 3. A dehumidification machine, similar to that described in (a) above and with a similar stand and cover, will be installed generally as shown on figure 23.

(f) Duct installation No. 3. Ductwork, of a similar type and with similar fittings described in (b) above, will be installed generally as shown on figure 23. The afterpeak hatch cover will be removed and stowed in the stores place. A galvanized sheet metal or exterior plywood blank will be installed over the hatch opening. The blank will be sealed with strippable coating and bituminous coating. It will be provided with a hole of sufficient size to introduce the dry air duct, and a hole of sufficient size to mount a sensing element contact. The hatch cover to the store area will be removed and stowed below in the stores space. The resulting opening will be covered with a blank fabricated from galvanized sheet metal or exterior grade plywood. The blank will be sealed with strippable coating and bituminous coating. It will be provided with three holes: one, of sufficient size to introduce the moist air return duct; another, to permit passage of the humidistat cable; and the third, to permit the mounting of a sensing element. Vessels of the first flight will have the steering ram under dehumidification. Dry air will go from the dehumidification machine to the starboard side of the hydraulic ram cover. The moist air return line will run from the portside of the hydraulic ram to the afterpeak hatch blank. For vessels of the second flight, dry air will go directly from the machine to the afterpeak hatch blank.

(g) Machine connections. Connection of ducts to the dehumidification machines will be made of unions or slip joints connections which permit easy removal of the machines for servicing.

(h) Ductwork supports. Ductwork run on deck will be supported by wood or metal stanchions. The ducts will be secured to the stanchions with metal strapping.

(i) Humidistats. Humidistats, one for each dehumidification machine, electronic type, will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within each dehumidified zone. The humidistats will be installed approximately 3 feet from the intake end of the moist air return line. The humidistats will be mounted so that they are protected against movement or damage. Rubber covered electrical cable with suitable terminal connectors will be installed to connect the humidistats to the dehumidification machines. The manufacturer's instructions will be followed in making electrical connections. Provisions will be made to prevent movement of the cables at the points where they leave the dehumidified area. The humidistats will be installed as follows:

For dehumidification machine No. 1, the humidistat will be installed in the crew quarters. The cable will pass through the manhole on the bulkhead between the crew quarters and the chain locker, up the chain pipe, and through the windlass cover, to the dehumidification machine;

For dehumidification machine No. 2, the humidistat will be secured to the forward side of the main switchboard in the engine room. The fire line to the portside fire station will be disconnected at the first flange below the main deck. The cable will run from the humidistat, up through the portside fire station blank, to the dehumidification machine;

For dehumidification machine No. 3, the humidistat will be secured on the starboard side of the stores area. The cable will run through the blank over the stores hatch to the dehumidification machine.

(j) Sensing elements. Three humidity sensing elements with 6-foot cables and two humidity sensing elements without cable will be installed as follows:

One sensing element without cable will be installed in the windlass cover. A portlight in the crew's washroom will be secured in open position and a blank will be installed. The blank will be provided with a hole of sufficient size to mount a sensing element;

A sensing element without cable will be mounted in the blank. The fire line to the starboard fire station will be disconnected at the first flange below the main deck;

A sensing element with cable will be secured in the portside of the stores area. The contact will be mounted in the blank over the stores hatch and will be shielded to prevent the entry of water into the contact fittings;

For first flight vessels with hydraulic steering ram, a sensing element with cable will be secured in the afterpeak and the contact mounted in the afterpeak hatch blank. This sensing element will be omitted on second flight vessels.

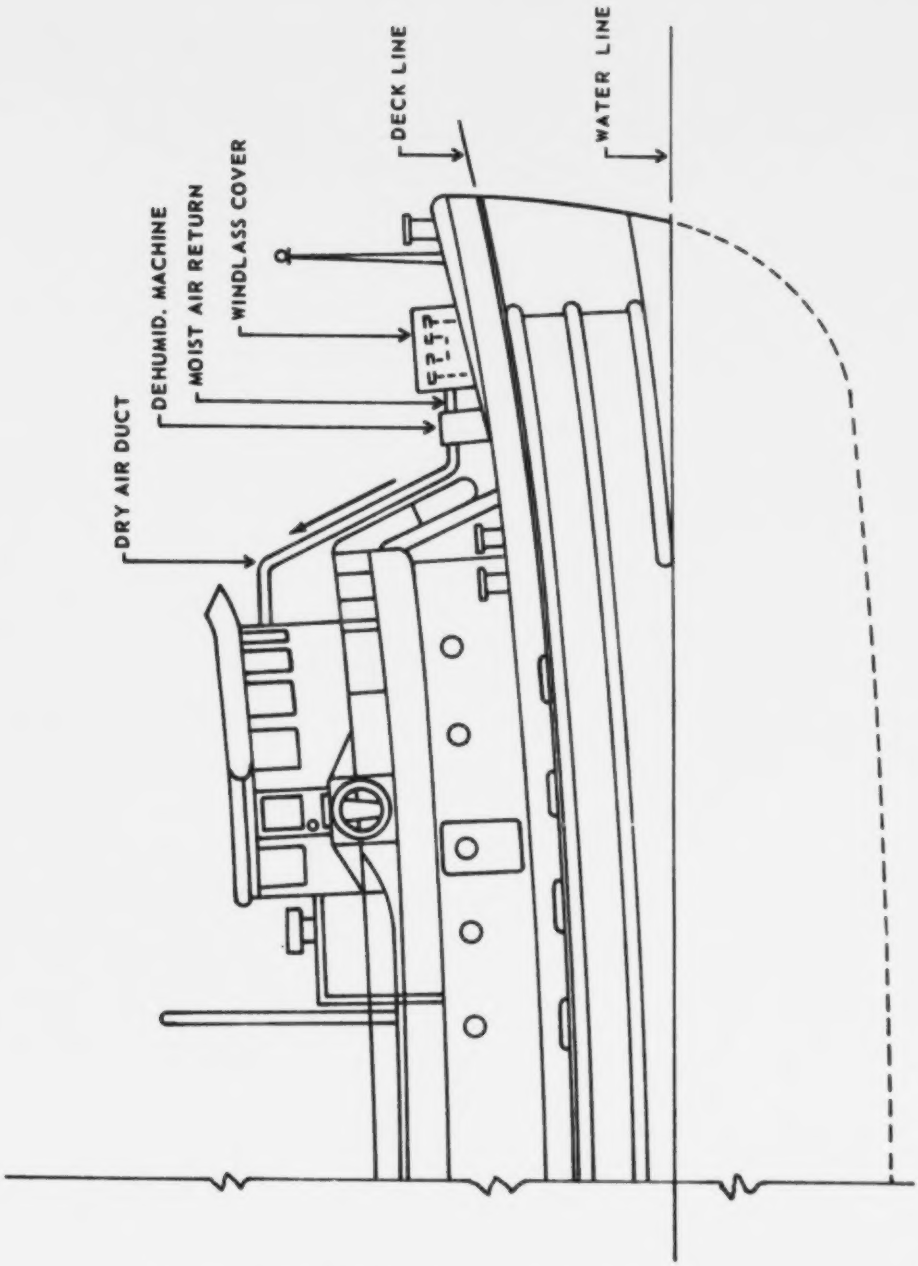

Figure 22. Dehumidification system No. 1 for tug design 3006.

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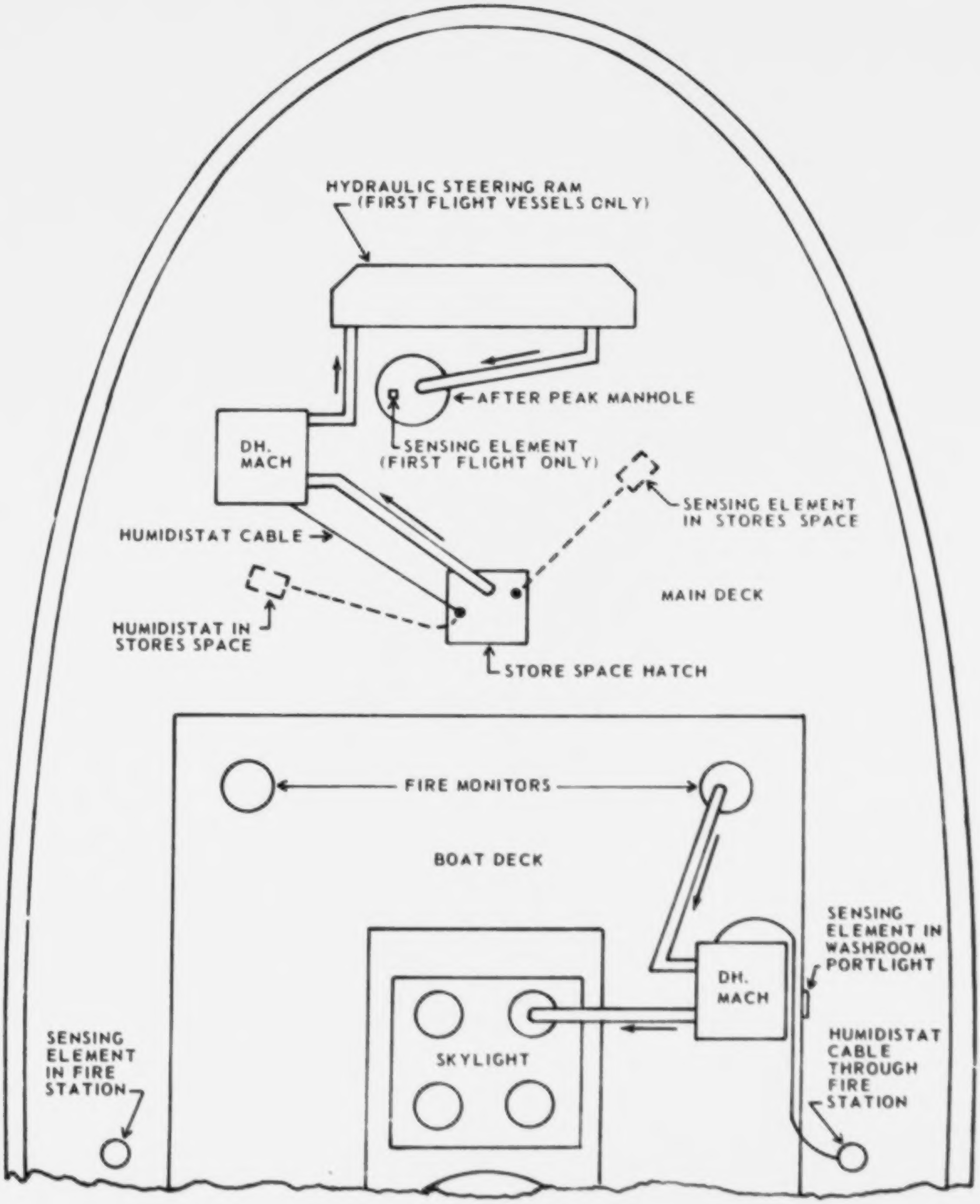
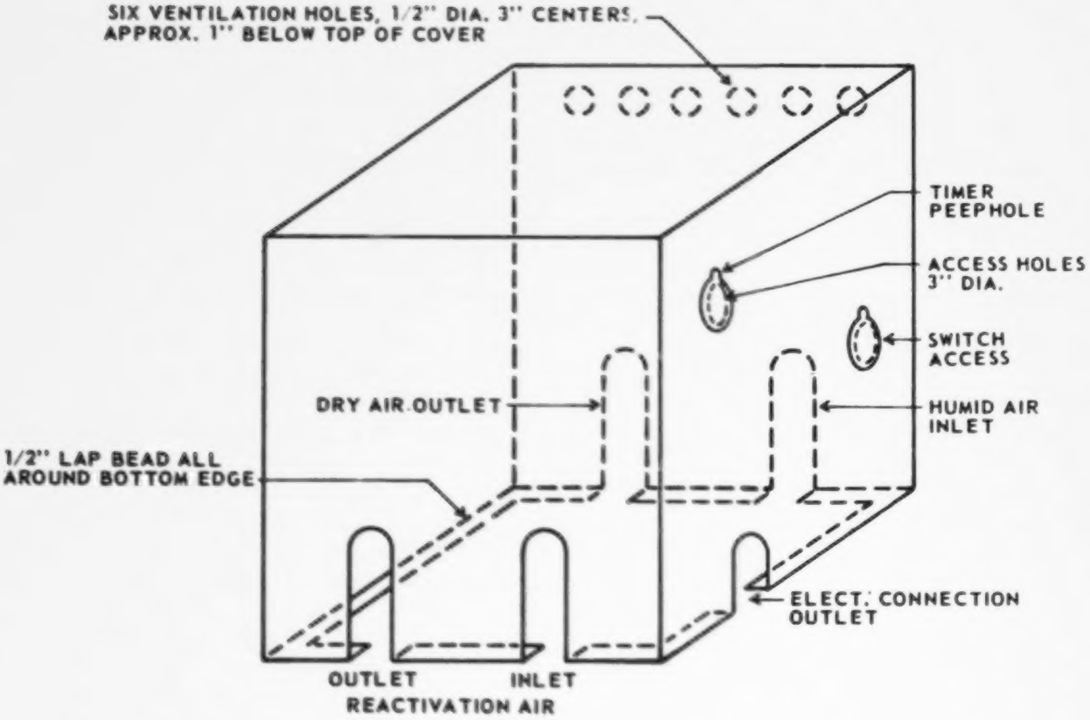
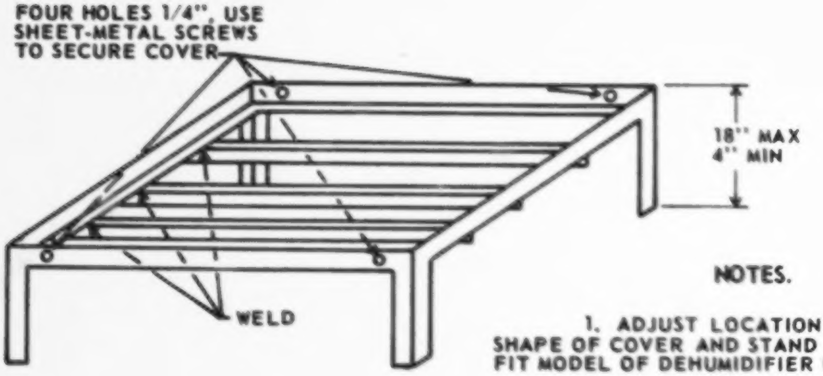

HYDRAULIC STEERING RAM
(FIRST FLIGHT VESSELS ONLY)
AFTER PEAK MANHOLE
DH. MACH
SENSING ELEMENT
(FIRST FLIGHT ONLY)
SENSING ELEMENT IN STORES SPACE
HUMIDISTAT CABLE
MAIN DECK
HUMIDISTAT IN STORES SPACE
STORE SPACE HATCH
FIRE MONITORS
BOAT DECK
SENSING ELEMENT IN WASHROOM PORTLIGHT
DH. MACH
SKYLIGHT
SENSING ELEMENT IN FIRE STATION
HUMIDISTAT CABLE THROUGH FIRE STATION

Figure 23. Dehumidification systems No. 2 and No. 3 for tug design 3006.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 24. Typical cover and stand for dehumidifier.

APPENDIX H

DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR BARGE, DECK OR LIQUID CARGO, NONPROPELLED, STEEL, 578-TONS OR 4,160 BARRELS, 120 FEET, DESIGN 231B

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1. General. This appendix provides detailed instructions for preparation of the cargo barge, design 231B, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Forward rake compartment.* The following items will be removed, identified, and stowed in the forward rake compartment:

(a) Anchor cable, stopper, and shackles.
(b) Windlass hand cranks.
(c) Towing bridles.
(d) Docking plug wrenches.
(e) Loading light masts.
(f) Navigational and anchor light standards.
(g) Anchor davit.
(h) Spare cable reel.
(i) Safety rail stanchions and chains.

(2) *Engine room.* The following items will be removed, identified, and stowed in the engine room:

(a) Anchor davit and cargo mast topping falls and blocks.
(b) Fog bell.
(c) Engine crank and spanner wrench.
(d) Fuel tank filling funnel.
(e) Rake bilge pumps.
(f) Anchor cable fairlead rollers and roller pins.
(g) Navigation lights.
(h) Flexible exhaust piping.
(i) Life rings and lines.
(j) Pressure vacuum relief valves.
(k) Cargo tank manhole covers.

(3) *Cargo hose.* The cargo hose, complete with all fittings, will be stowed in the after rake compartment.

NOTE

The cargo hose, complete with all fittings, may be stowed on the main deck when stowage in the after rake compartment is not feasible. When stowed on deck, the hose will be laid straight and protected with a light timber casing.

(4) *Cargo boom.* The boom will be lowered and secured with the bitter end resting on deck.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The engine room and the six cargo tanks will be prepared for dehumidification.

(2) *Provisions for ventilation and air circulation.*

(a) *Anchor windlass cover.* A ventilated, demountable cover will be fabricated and installed over the windlass. The sides and ends will be fabricated generally as shown on figure 29 and shall be painted as specified herein. To facilitate disassembly, the sides and ends will be fastened to each other with galvanized hooks and eyes. A minimum of two fasteners will be used at each junction of a side and end. A roof, fabricated from minimum No. 20 gage galvanized sheet metal, will be fitted over the sides and ends and will overlap approximately 2 inches. Two lengths of minimum No. 12 gage black annealed wire, positioned approximately one-third the length of the cover from each end, will be secured to screw eyes located in the sides of the cover. The cover will be secured by wiring to convenient points.

(b) *Rake bilge pump pipe openings.* Gooseneck vents will be fabricated from galvanized sheet metal and installed over the pipe openings resulting from removal of bilge pumps. The exterior terminus of the vents will be covered with galvanized metal insect screens.

(c) *Cargo tanks.* The tanks will be closed off and isolated by closing the suction, discharge and by pass valves at the cargo pump. Tag each of these valves with a waterproof tag clearly marked "DO NOT OPEN THIS VALVE." The filling and suction line valves located in each tank will be left in an open position. Covers will be fabricated from No. 20 gage galvanized sheet metal and installed over the manholes. The covers will be form fitted over the exterior of hatch covering to permit sealing around the edges. Provisions will be made in the sheet metal covers for entrance of dehumidification air ducts, cables for humidistats, and sensing elements as required.

(d) *Forward and after rake compartments.* The covers on the gooseneck vents for the forward and after rake compartments will be secured in an open position. The exterior terminus of the gooseneck vents will be fitted with standard galvanized metal insect screens.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) *Exhaust system.* Openings in the muffler and the exhaust piping above the machinery house roof will be closed with blanks, plugs or pressure-sensitive tape and then sealed with strippable coating and bituminous coating.

(b) *Louvered door.* The door will be secured in closed position and sealed with strippable coating and bituminous coating. The louvers will be blanked or masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(c) *Engine room vents.* The engine room vents located on the roof of the machinery house will be closed with blanks, caps, plugs or pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(d) *Cargo tank sheet metal manhole covers.* All joints and seams in the covers and apertures between the coaming and the deck will be sealed with strippable coating and bituminous coating.

(e) *After rake and bilge vent.* The vent duct from the rake bilge will be disconnected below the machinery house deck. The opening leading to the engine room will be closed with plugs, caps, blanks, or pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(f) *Dehumidification piping system.* The connecting points of all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All joints and seams in the ducts will be similarly sealed.

(4) *Installation of dehumidification systems.* Three dynamic dehumidification systems (No. 1, 2, and 3) will be installed for the six cargo tanks. One dynamic dehumidification system (No. 4) will be installed for the engine room.

(a) *Dehumidification systems No. 1, 2, and 3.* Install three package dehumidifiers, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating current, as shown on figure 25. The machines will be mounted on stands and protected with covers fabricated in accordance with figure 28. One machine will dehumidify two cargo tanks. The machines will be installed between the port and starboard manholes and connected to all manholes in accordance with figure 25. Dehumidified air will be circulated through all manholes by means of 4 inch galvanized metal duct. Connect two lengths of 4 inch flexible hose, conforming to MIL Spec H-8796, inside each tank to carry air to the lower extremities of the tanks. Install three hair type humidistats, one in each starboard tank. Each humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within each dehumidified zone accordance with figure 25. Secure the humidistats approximately three feet above the bottom of the tanks. Connect the humidistats to the dehumidification machines with lengths of No. 18, two-conductor, rubber-covered cable with suitable terminal connectors. Install one sensing element with six foot cable in the metal blank over each manhole in accordance with figure 25. Ductwork run on deck will be supported on wood or metal stanchions. The ducts will be fastened to the stanchions by galvanized strapping secured to the stanchions.

(b) *Dehumidification system No. 4.* A package dehumidifier, similar to and similarly mounted as specified for systems 1, 2, and 3, will be installed as shown on figure 26 or 27. One machine will be used to dehumidify the engine rooms of from two to four barges. Four inch diameter, No. 26 gage, galvanized sheet metal ducts, with necessary ells, reducing fittings, and connections, will be installed as shown on figure 26 or 27. Suitable penetrations large enough to permit the introduction of air ducts and the mounting of a sensing element in one blank will be provided in the port and starboard bulkheads of the machinery house of each barge. The air from the dehumidification machine will enter one side of the machinery house bulkhead and will be removed from the opposite side. The connecting ducts between the barges will be flexible hose conforming to MIL Spec H-8796. The flexible hose will be at least four feet longer than the distance between terminal connections. Connections of ducts to the dehumidification machine will be made with unions or slip joint connections which permit easy removal of machine for servicing. A hair type humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified area. The humidistat will be installed in the machinery house of the barge from which the moist air return duct goes directly to the dehumidification machine. The humidistat will be connected to the dehumidification machine with No. 18, two-conductor, rubber-covered cable with suitable terminal connectors. Humidity sensing elements, with cable, will be installed as shown on figure 26 or 27. One sensing element will be mounted in the blank used for introduction of the moist air return ducts on each barge.

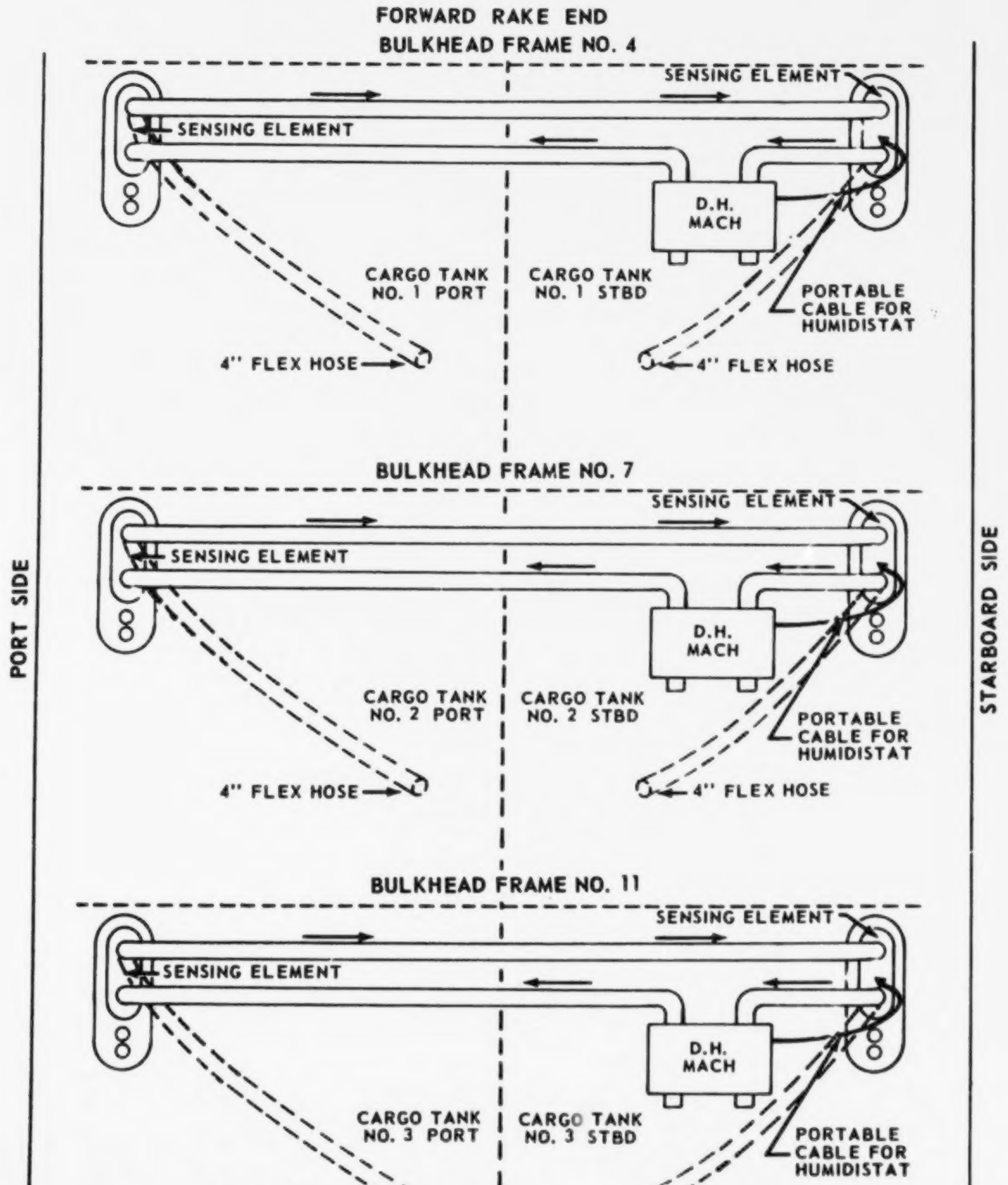


FIGURE 25.

Figure 25. Dehumidification system.

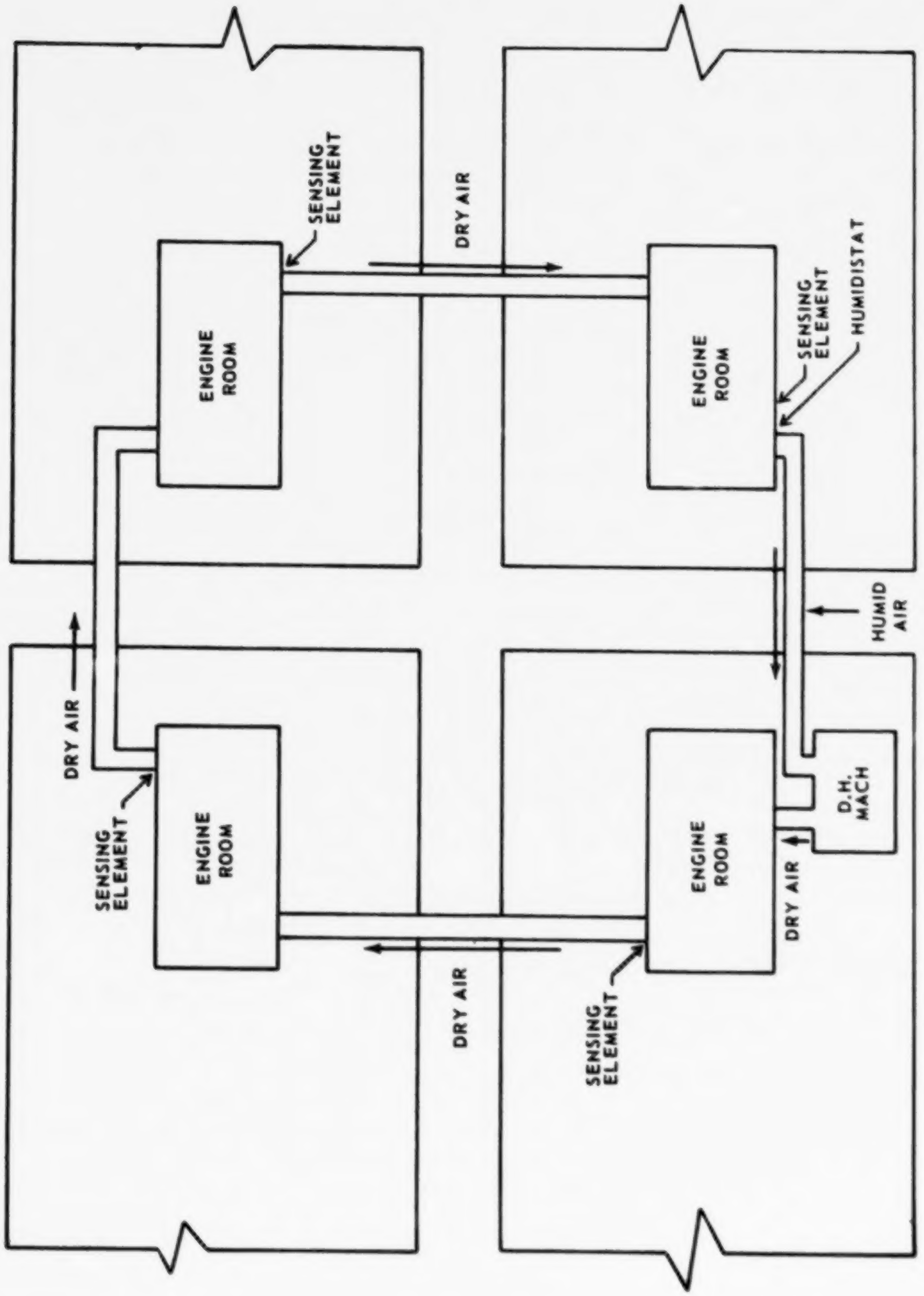
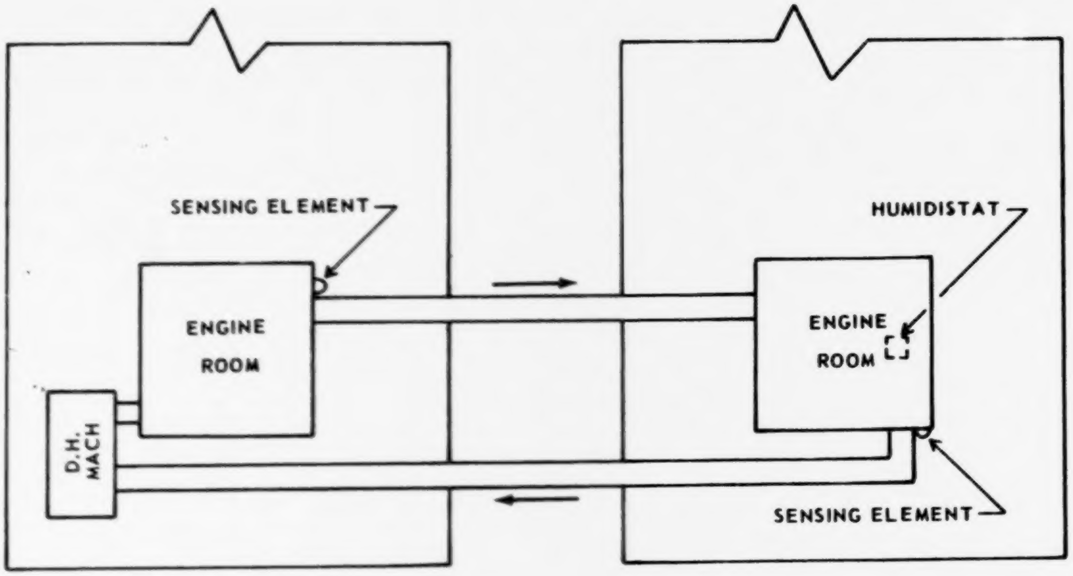
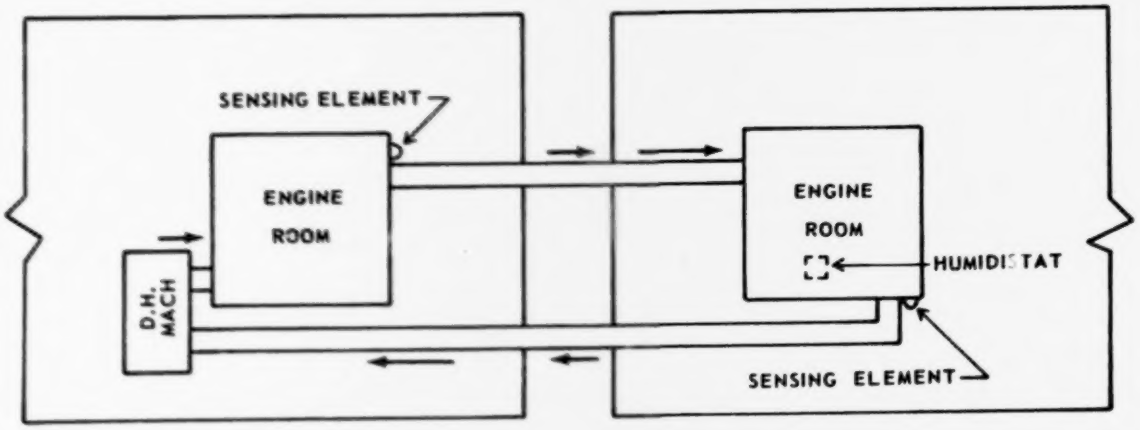


Figure 26. Dehumidification system.

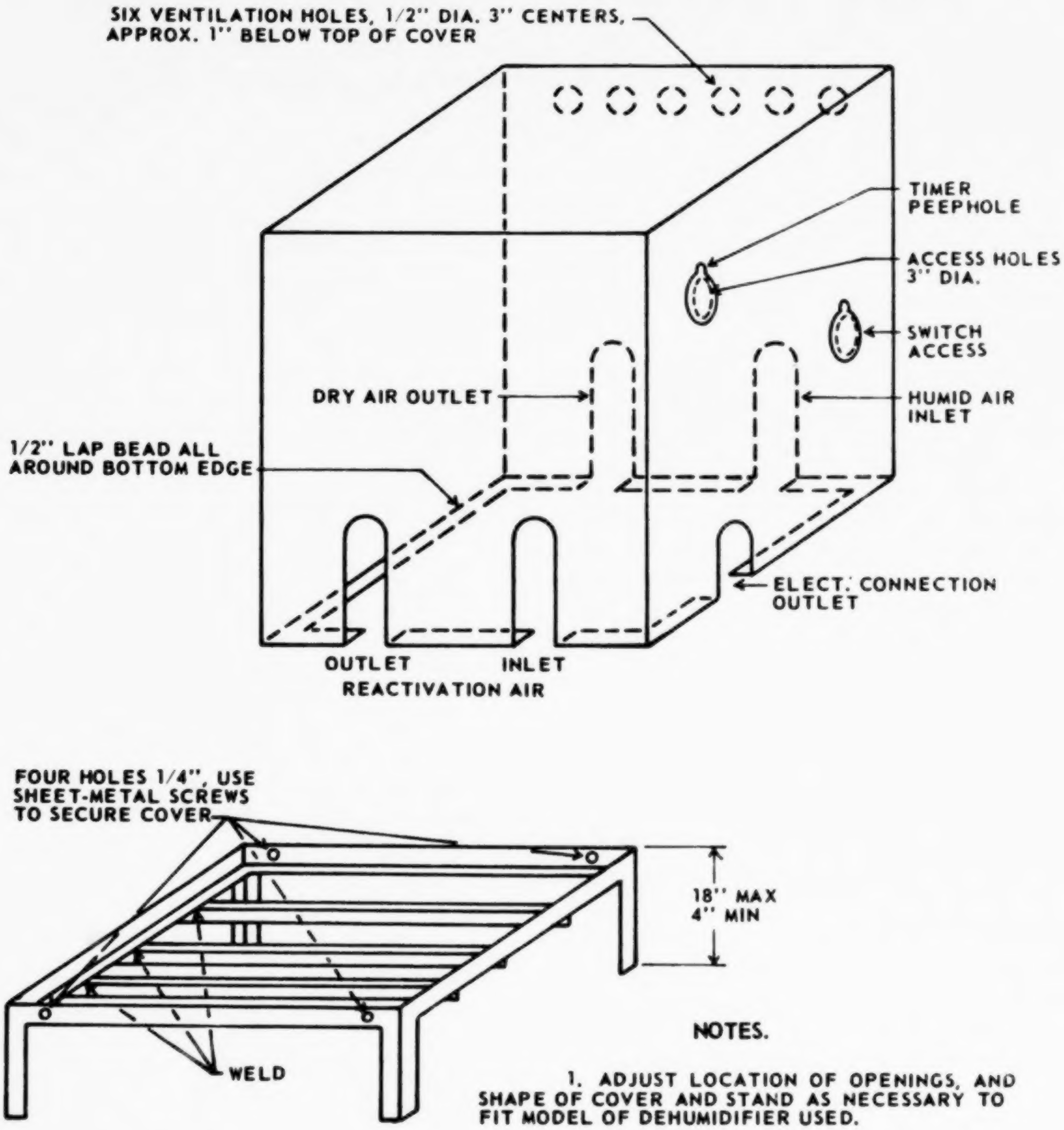


SIDE BY SIDE



STERN TO STERN

Figure 27. Dehumidification system.


SIX VENTILATION HOLES, 1/2" DIA. 3" CENTERS, APPROX. 1" BELOW TOP OF COVER
TIMER PEEPHOLE
ACCESS HOLES 3" DIA.
SWITCH ACCESS
DRY AIR OUTLET
HUMID AIR INLET
1/2" LAP BEAD ALL AROUND BOTTOM EDGE
ELECT. CONNECTION OUTLET
OUTLET
INLET
REACTIVATION AIR
FOUR HOLES 1/4", USE SHEET-METAL SCREWS TO SECURE COVER
18" MAX
4" MIN
WELD

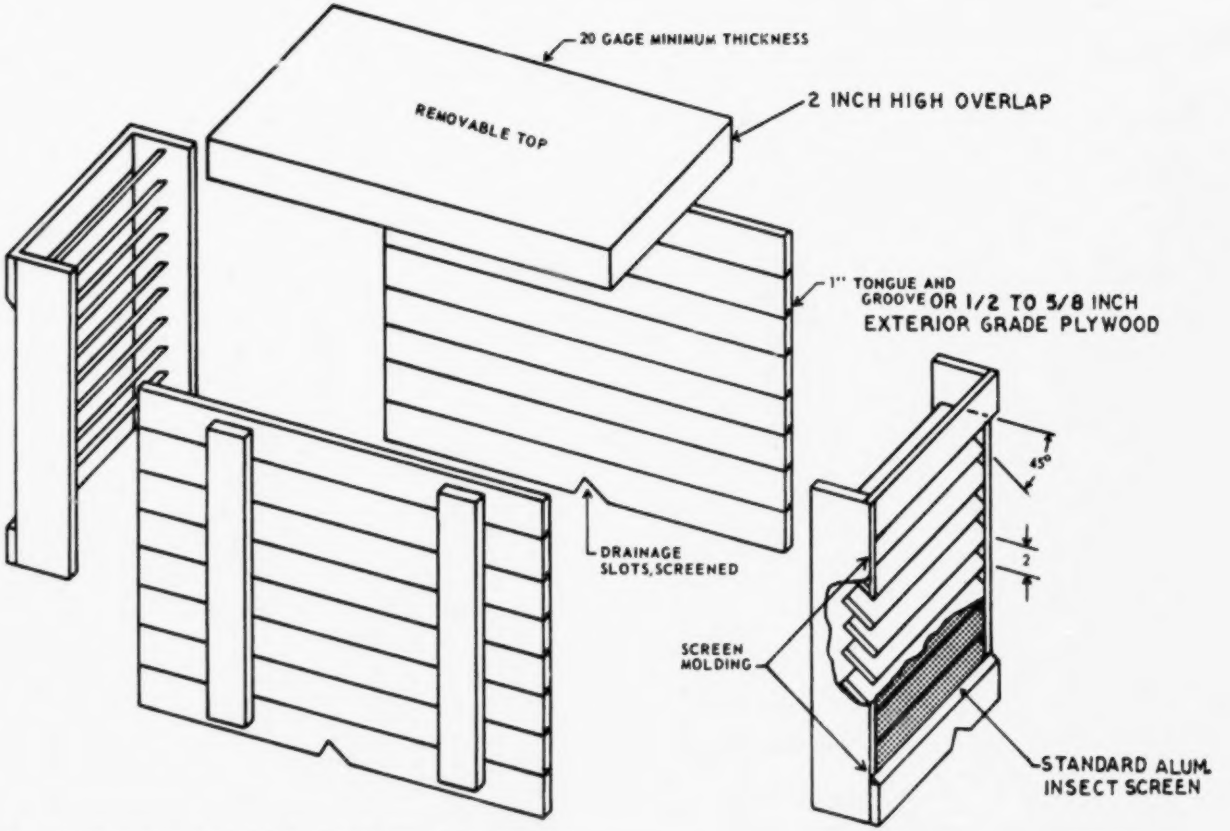
NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 28. Typical cover and stand for dehumidifier.


20 GAGE MINIMUM THICKNESS
2 INCH HIGH OVERLAP
REMOVABLE TOP
1" TONGUE AND GROOVE OR 1/2 TO 5/8 INCH EXTERIOR GRADE PLYWOOD
45°
2
DRAINAGE SLOTS, SCREENED
SCREEN MOLDING
STANDARD ALUM. INSECT SCREEN

ALL TONGUE AND GROOVE LUMBER TO BE 1" NOMINAL
ALL EXTERIOR GRADE PLYWOOD TO BE 1/2 TO 5/8 INCH NOMINAL
NOTE: ALL WOODEN SURFACES TO BE PAINT AS SPECIFIED HEREIN

Figure 29. Ventilated cover.

APPENDIX I

DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR BARGE, LIQUID CARGO, NONPROPELLED, STEEL, 13,000 BARREL, 235 FEET, DESIGN 7004

1. General. This appendix provides detailed instructions for the preparation of the liquid cargo barge, design 7004, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Forward rake compartment.* The following items will be removed, identified, and stowed in the forward rake compartment:

(a) Anchor davit.
(b) Windlass hand crank.
(c) Forward rake access cover.
(d) Light standards.
(e) Blank flanges.

(2) *Engine house.* The following items will be removed, identified, and stowed in the engine house:

(a) Fire axe.
(b) Fire extinguishers.
(c) Warning tag.
(d) Fog bell.
(e) Engine crank and spanner wrench.
(f) Rake bilge pumps.
(g) Navigational and signal lights.
(h) Ring life buoy.
(i) Rope.
(j) Exhaust flexible connection.
(k) Cargo tank manhole covers.

(3) *After rake compartment.* The following items will be removed, identified, and stowed in the after rake compartment:

(a) Cargo hose, complete with fittings.

NOTE

The cargo hose complete with all fittings, may be stowed on the main deck when stowage in the after rake compartmetn is not feasible. When stowed on deck, the hose will be laid straight and protected by a light timber casing.

(b) Boat hook.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The engine room and the eight cargo tanks will be prepared for dehumidification.

(2) *Provisions for ventilation and air circulation.*

(a) Cargo tanks. The tanks will be closed off and isolated by closing the suction discharge, and by pass valves at the cargo pump. Tag each of these valves with a waterproof tag clearly marked "DO NOT OPEN THIS VALVE." The filling and suction line located in each tank will be left open. Covers will be fabricated from No. 20 gage galvanized sheet metal and installed over the manholes. The covers will be form fitted over the exterior of hatch covering to permit sealing around the edges. Provisions will be made in the sheet metal covers for entrance of dehumidification air ducts, cables for humidistats, and sensing elements as required.

(b) Rake compartments. The forward and after rake compartment vent covers will be secured in an open position. A cover fabricated from exterior grade plywood or minimum No. 18 gage galvanized sheet metal will be secured over the opening resulting from removal of the center access cover of the forward rake compartment. A hole will be provided in the blank of sufficient size to receive a goose-neck vent fabricated from galvanized sheet metal or a marine type turbine ventilator approximately 10 inches in diameter. The gooseneck vents will be turned downward 180° and the exterior opening provided with a galvanized insert screen. The edges of the blank will be sealed with strippable and bituminous coating.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below.

(a) Engine room vents. The engine vents located on the roof of the machinery house will be closed with blanks, caps, plugs or pressure-

sensitive tape and sealed with strippable coating and bituminous coating.

(b) Dehumidification piping system. The connecting points of all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All seams in the ducts will be similarly sealed.

(c) Cargo tank sheet metal manhole covers. All joints and seams in the covers and apertures between the coaming and the deck will be sealed with strippable coating and bituminous coating.

(d) Exhaust system. Openings in the muffler and exhaust piping outside the machinery house will be closed with blanks, plugs, or pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(4) *Installation of dehumidification systems.* Four dynamic dehumidification systems (No. 1, 2, 3, and 4) will be installed for eight cargo tanks. One dynamic dehumidification system (No. 5) will be installed for the engine room.

(a) Dehumidification systems No. 1, 2, 3, and 4. Install four package dehumidifiers, single desiccant bed absorbent type, 10,000 cubic foot capacity, 110-volt, alternating current, as shown on figure 30. The machine will be mounted on stands and protected with covers fabricated in accordance with figure 32. One machine will dehumidify two cargo tanks. The machine will be installed between the port and starboard manholes and connected to all manholes in accordance with figure 30. Dehumidified air will be circulated through all manholes by means of 4 inch galvanized metal duct. Connect two lengths of 4-inch flexible hose, conforming to MIL Spec H-8796, inside each tank to carry air to the lower extremities of the tanks. Install four hair type humidistats, one in each starboard tank, in accordance with figure 30. The humidistats will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified area. Secure the humidistats to the dehumidification machines with lengths of No. 18 two-conductor, rubber-covered cable with suitable terminal connectors. Install one sensing element with six foot cable in the metal blank over each manhole in accordance with figure 30. Duct work run on deck will be supported on wood or metal stanchions. The ducts will be fastened to the stanchions by galvanized strapping secured to the stanchions.

(b) Dehumidification system No. 5. A package dehumidifier, similar to and similarly mounted as specified for systems 1, 2, 3, and 4, will be installed as shown on figures 31 and 31 — Continued. One machine will be used to dehumidify the engine rooms of from two to four barges. Four-inch diameter, No. 26 gage galvanized sheet metal ducts, with necessary ells, reducing fittings, and connections, will be installed as shown on figure 31 and 31 — Continued. Suitable penetrations large enough to permit the introduction of air ducts and the mounting of a sensing element in one block will be provided in the port and starboard bulkheads of the machinery house of each barge. The air from the dehumidification machine will enter one side of the machinery house bulkhead and will be removed from the opposite side. The connecting ducts between the barges will be flexible hose conforming to MIL Spec H-8796. The flexible hose will be at least four feet longer than the distance between terminal connections. Connections of ducts to the dehumidification machine will be made with unions or slip joint connections which permit easy removal of machine for servicing. A hair type humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified area. The humidistat will be installed in the machinery house of the barge from which the moist air return duct goes directly to the dehumidification machine. The humidistat will be connected to the dehumidification machine with No. 18 two-conductor, rubber-covered cable with suitable terminal connectors. Humidity sensing elements, with cable will be installed generally as shown on figure 31 or 31 — Continued. One sensing element will be mounted in the blank used for introduction of the moist air return ducts on each barge.

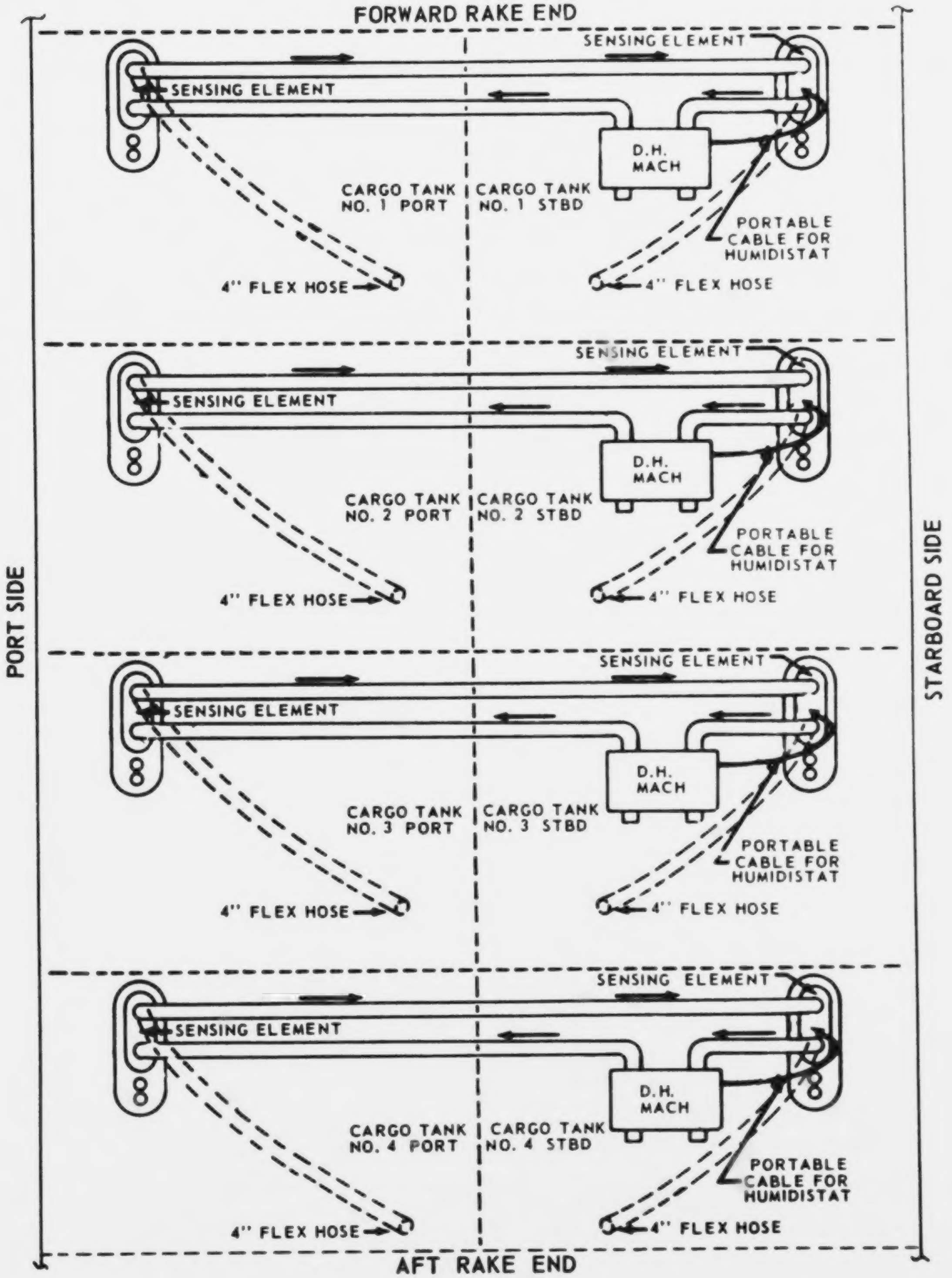


Figure 30. Dehumidification system.

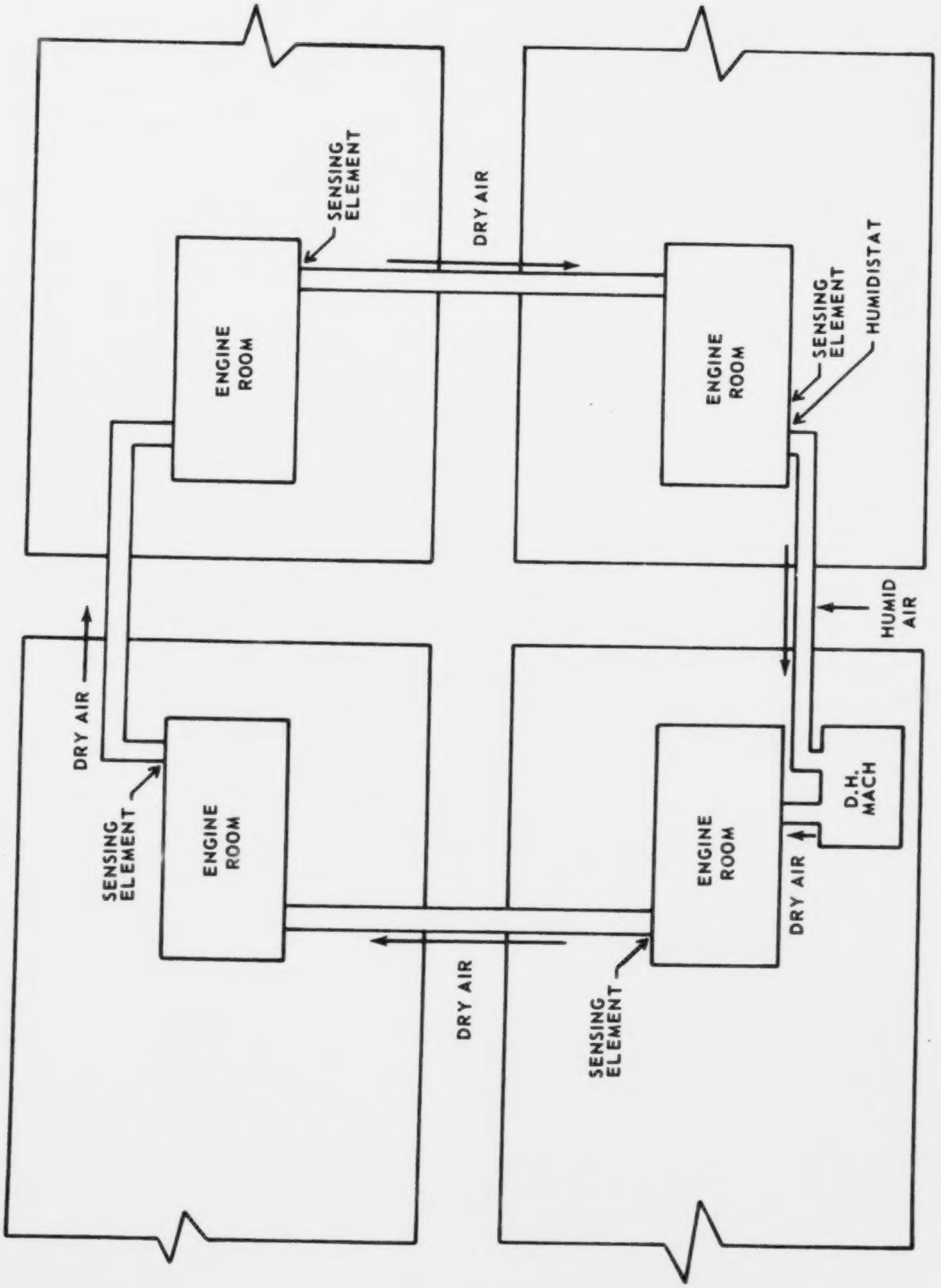
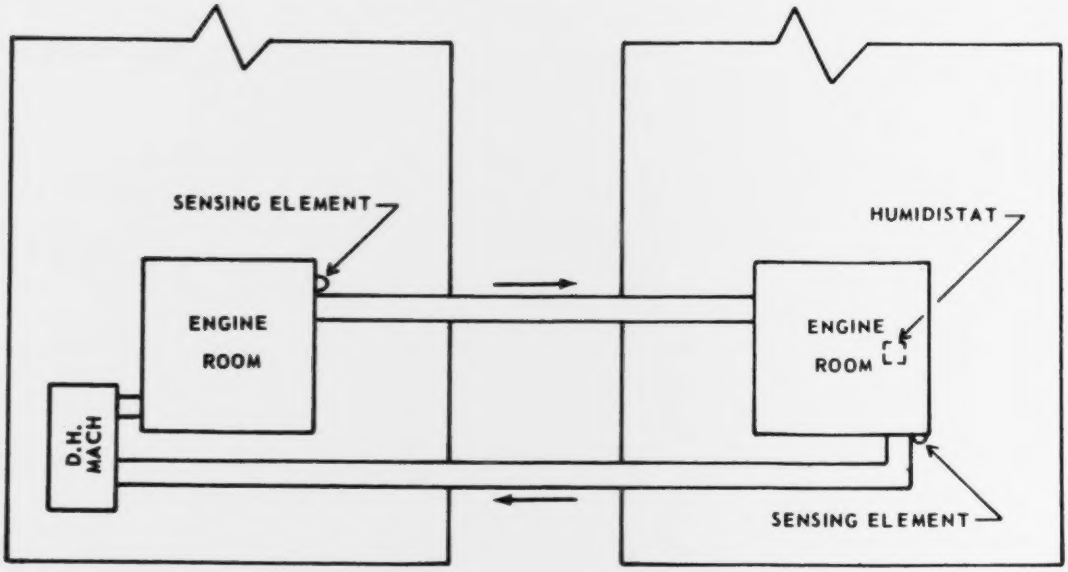
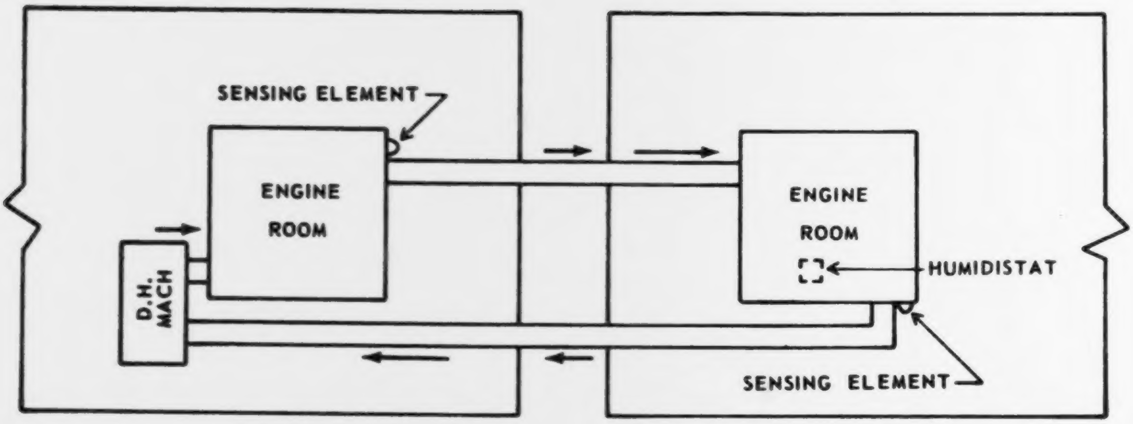


Figure 31. Dehumidification system.

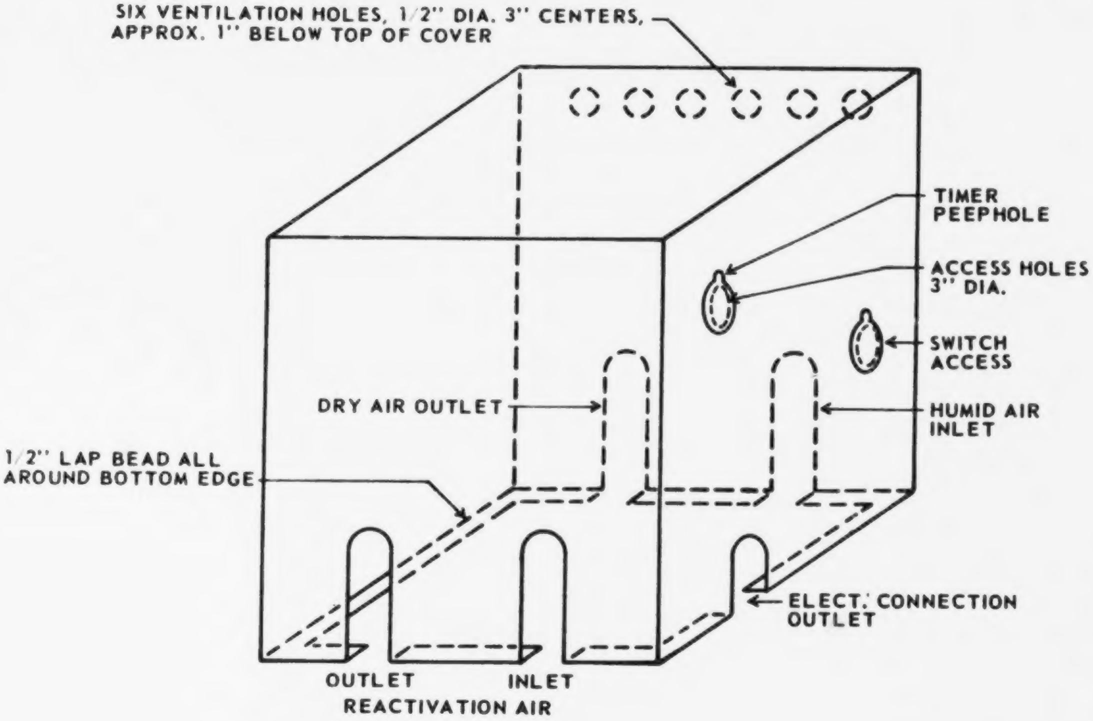


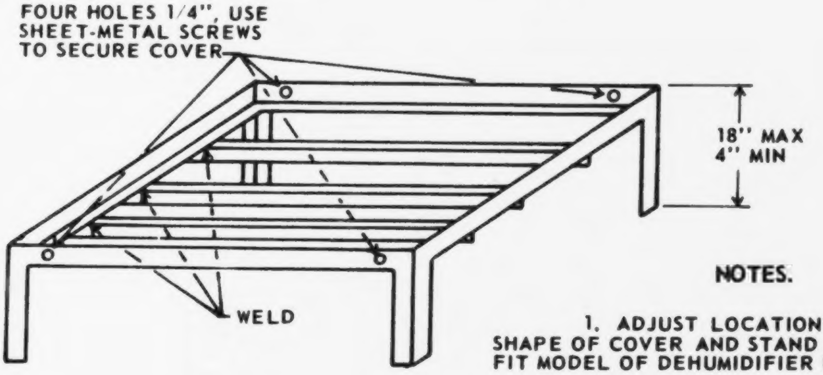
SIDE BY SIDE



STERN TO STERN

Figure 31. Continued.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 32. Typical cover and stand for dehumidifier.

APPENDIX J
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR LIGHTER, AMPHIBIOUS (LARC-V), SELF-PROPELLER, ALUMINUM, 5-TON, DESIGN 8005

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1. General. This appendix provides detailed instructions for preparation of the amphibious lighter (LARC-V), design 9005 for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) Windshield wipers, horn, compass, radio antenna and mast range light, if installed, shall be removed, tagged for identification and packaged to prevent breakage and stowed in forward compartment.

(2) Anchor life line and life preserver will be stowed in forward compartment.

(3) Anchor and boat hook will be stowed in transfer case hatch.

(4) Bulwark panels complete with cables and end bars shall be removed, if installed, and rolled to the smallest practical size, wrapped in barrier material conforming to PPP-B-1055, sealed with tape, conforming to PPP-T-60, and identified to the hull number from which removed and stowed in the transmission hatch.

(5) Remove the fabric canopy top and back sections (hull number below 732) and the fabric back section of LARC-V's with metal canopy (hull number above 732). Wrap fabric canopy in barrier material conforming to PPP-B-1055, seal with tape, PPP-T-60, taking care not to crease the transparent panels. Package metal retaining strip and screws, identify by hull number, attach to fabric canopy and store in transmission hatch.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified Area.* The cab and all interior surfaces of the lighter will be prepared for dehumidification.

(2) *Provisions for ventilation and air circulation.*

(a) Method 1 —Figures 33 and 34. The forward hatch cover and the air intake retainer and screen on the engine hatch assembly will be removed and stowed in the forward hatch. The resulting openings will be covered with blanks fabricated from exterior grade plywood or sheet metal. The blanks will each be provided with a hole to receive a four inch duct for the passage of air. On lighters having air intake openings on both sides of the engine hatch center support, the openings will be covered with blanks as specified above. One blank on either side may be utilized for introduction of the air duct. The blank over the moist air outlet will also be provided with a hole for mounting of a sensing element. In addition, the moist air outlet blank of every fourth lighter will be provided with a hole to receive a humidistat cable.

(b) Method II — Figure 35.

1. Engine compartment and forward hatches shall be sealed by drawing existing hatch cover gasket down on coaming and applying a bead of sealing to the aperature between the hatch and coaming. The latch penetrations shall be sealed with strippable compound. Remove the hull access plate to the lower radiator hose in two opposite LARC-V's, tag for identification and stow in operator's cab. Fabricate No. 26 gauge galvanized sheet metal flanged adapter fitting to connect ducting to opening utilizing existing bolting ring for attachment.

2. Remove the blank flange from the radio antenna mounting pad, tag for identification and stow in operators cab. Fabricate no. 26 gauge galvanized sheet metal flanged adapter fittings to connect ducting to openings, utilizing existing bolting pad for attachment.

NOTE

Blanks and panels fabricated from metal dissimilar to the lighter hull will be coated or otherwise insulated at points of contact with hull.

(3) *Sealing for dehumidification.* Materials and methods used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) Hull openings. Pump outlets, fuel tank vents, heater exhaust outlets and any and all other hull openings found to be a source of leakage will be sealed with pressure sensitive tape, strippable coating, and bituminous coating.

(b) Exhaust pipes. Exhaust pipes will be plugged and sealed to prevent passage of air.

(c) Cab openings. The opening caused by the removal of the fabric canopy top and back sections will be covered with No. 20 gauge galvanized sheet metal cover for top of windshield assembly (hull numbers below 732) and for back section of all hull numbers. Covers shall be flanged and secured with sheet metal screws using existing fastenings where feasible. Reposition the existing windshield assembly top cross members to eliminate interference and provide stiffeners to support cover blanks. Install a readily removable access panel approximately twenty-four (24) inches in the back cover of the operator's cab. Panel shall be designed for sealing by means of tape and strippable compound. All dimensions for covers shall be taken from LARC V applicable series. Install galvanized sheet metal or plywood panels over operator's cab windows to fit window frame. All joints will be sealed with strippable compound and bituminous coating. Drain openings at rear of cab including air and fuel vents on bulkhead aft of cab, and vent in strong back will be masked and sealed with strippable compound and bituminous coating.

(d) Dehumidification piping system. The points of entry of all air ducts into compartments and the connecting joints of all air ducts will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters and other devices used to attach or introduce the tubing or ducts.

(4) *Installation of dehumidification system.* Normally a dynamic dehumidification system will be installed for each group of four lighters. Installation of the dynamic dehumidification system will be generally as shown in figures 33, 34, or 35. When dehumidification of the lighters is accomplished on an individual basis, installation of the dynamic dehumidification system will be in accordance with this bulletin.

(a) Dehumidification machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic feet capacity, 110 volt, alternating current, will be installed as shown on figures 33, 34 or 35. The machine will be mounted on a stand and protected with a cover fabricated generally in accordance with figure 36.

1. The machine will be installed on the engine hatch cover (for lighters stored as shown in figures 33 and 34) in a manner to require a minimum of turns in the ductwork and will be secured in place to prevent movement.

2. Lighters stored stern to stern as shown in figure 35 the machine will be mounted on a stand at lighter's stern and the stand will be secured in place with existing bolts in a position to provide the most direct connection for ducting to the hull access openings. The machine stand will be fabricated as shown in figure 37. The machine will be protected with a cover fabricated in accordance with figure 36.

(b) Machine connections. Connections of ducts to the dehumidification machine will be made of unions or slip joint connections which permit easy removal of the machine for servicing.

(c) Duct installation. Four-inch diameter, No. 26 gauge galvanized tubing, with necessary ells, reducing fittings and connections will be installed as shown on figures 33, 34 and 35. Flanges of galvanized metal will be joined to the ductwork to attach it to openings in the blanks prepared for its entrance into the lighter. The flanges will be constructed with collars or suitable tabs to resist dislodgement from the blank openings. Ductwork will be supported as necessary by use of wooden or metal A-frames or other structures.

(d) Humidistat. A hair type humidistat will be set to maintain a 40 percent relative humidity, plus or minus 5 percent, within the dehumidified areas. The humidistat will be installed approximately three feet above the floor plate level in the compartment of the lighter from which the moist air is ducted back to the humidifier. A bracket will be provided to retain the humidistat. The humidistat will be wired to the dehumidifier with No. 18, two-conductor, rubber covered cable. The cable will follow moist air return ducting to support and shall penetrate the hull through the blank as shown in figure 33 and 34 and at the adapter fitting as shown in figure 35.

(e) Humidity Sensing elements. Humidity sensing elements will be installed in the blanks for lighters stored as shown on figure 33 and 34. Lighters stored stern to stern as shown in figure 35, fabricate adapter plate and install humidity sensing elements in one (1) hydraulic bilge pump overboard discharge hull fitting of each lighter. Mount the sensing element on the most accessible fitting near the moist air outlet of each hull as shown in figure 35. Remove hose from bilge pump overboard pipe to provide opening in hull.

c. Preparation of Rubber Tires for Storage.

(1) *Blocking lighters during storage.* Lighters will not require blocking during storage. Pneumatic tires will be inflated to 30 lbs. per sq. inch.

(2) *Protection of tires during storage.*

Lighters stored in open areas or shed storage in excess of 90 days will have the tires protected as specified below:

(a) Installed pneumatic and semi-pneumatic tires, manufactured from natural or synthetic compounds or a combination thereof, will be protected during storage by inclosing tires and wheels within protective polyethylene bags as outlined in Specification MIL-T-46755(MO).

(b) Tires identified as manufactured with OZ compounds (as illustrated in fig. 2 of MIL-T-46755(MO)) do not require additional protection until 2 years from the date of manufacture, After 2 years from the date of manufacture, tires will be protected as specified in (a) above.

(c) When a lighter is equipped with a combination of NON-OZ and OZ tires less than 2 years old and any other tires 2 years old or older, all tires on the lighter will be protected during storage as specified in (a) above.

(3) *Preparation prior to placing bag over tire and wheel assembly.*

(a) *Slack allowance.* Lighters will be raised for installation of bags. Care will be exercised to assure that sufficient slackness is left in the bottom of the bags when the lighter is lowered to the ground. The bag will be positioned in a manner which will prevent obstruction of drain holes when bag contacts ground surface. If the inclosed tires and wheels are to be stored on gravel, turf or unpaved areas, a piece of fiberboard or other suitable material of sufficient size will be placed on the ground surface under the bag to prevent rupturing the bag.

(b) *Cleaning.* Prior to installation of the polyethylene bag, each tire and wheel assembly will be cleaned in accordance with process C-1 of MIL-P-116 to insure removal of all foreign objects inbedded or lodged in tire treads. Tires will be thoroughly dried in accordance with any applicable drying process of MIL-P-116.

(4) *Installation of bags.* Polyethylene bags will be placed over the tire and wheel assembly and positioned in a manner that will permit securing to axes. Excess material at the bag opening will be folded and formed to the contour of and against the axle assembly. Bag will then be secured to the axle assembly using rope conforming to class 2, size (circumference) 5/8 inch, of T-R-571. Corners of the bag will be folded against the installed bag and secured in that position with tape conforming to type IV of PPP-T-60.

(a) *Drain holes.* Two drain holes approximately 1/4 inch in diameter will be provided in each bag. Drain holes will be positioned at the lowest point of the installed bag, as illustrated in figure 3 of MIL-T-46755 (MO).

(b) *VCI application.* Crystalline volatile corrosion inhibitor (VCI) or treated carrier type VCI will be used within each polyethylene bag. When crystalline VCI is used, it will conform to type I of MIL-I-22110, dicyclohexyl ammonium nitrate formulation, NSN 6850-00-368-5233. Twenty grams will be blown into the polyethylene bag by any suitable means. When treated carrier VCI is used, it will conform to type I, class 2, style B of MIL-I-3420, dicyclohexyl ammonium nitrite formulation, NSN 8135-00-664-4012. One strip 12 inch wide and length equal to the circumference of the tire plus 2 inches, will be placed around the circumferences of the tire, VCI side out per polyethylene bag, and will be secured in place with tape conforming to type IV of PPP-T-60.

(5) *Surveillance of bagged tires.* Periodic surveillance of storage areas where lighters containing bagged tires are stored will be maintained to determine condition of bags. When bags are loosened due to severe wind storms, the bags will be retightened at the ties. All small tears will be sealed with tape conforming to type IV of PPP-T-60. If severe damage occurs, the tire bag will be replaced.

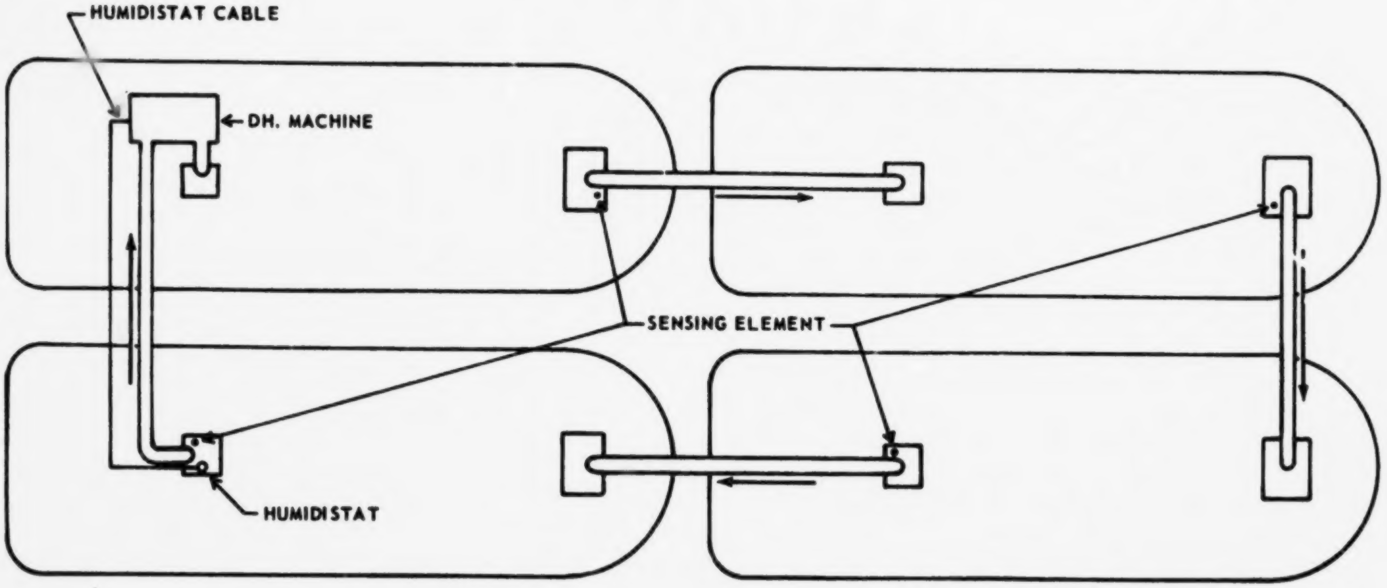


Figure 33. Dehumidification system for LARC V design 8005.

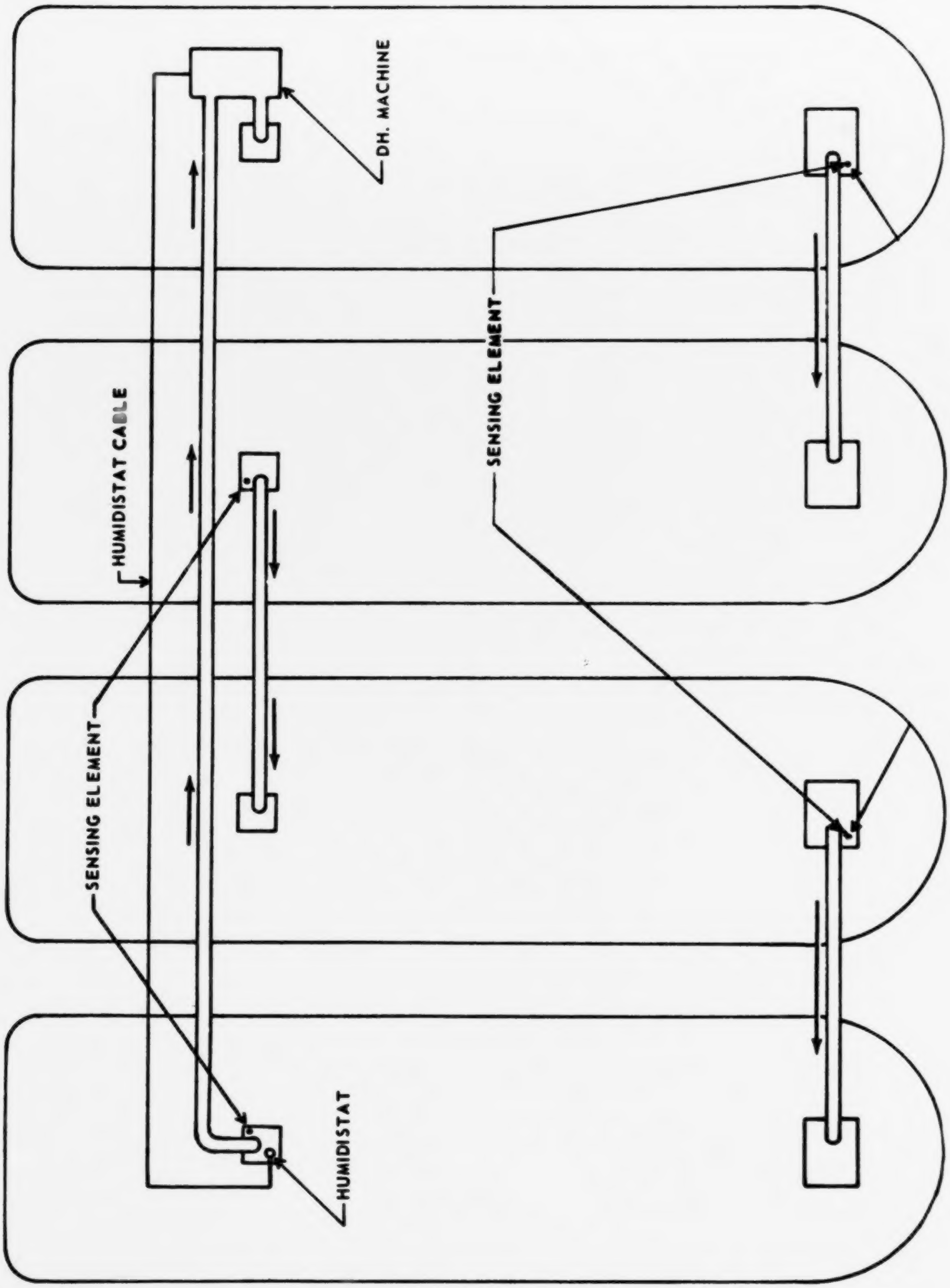


Figure 34. Dehumidification system for LARC V design 8005.

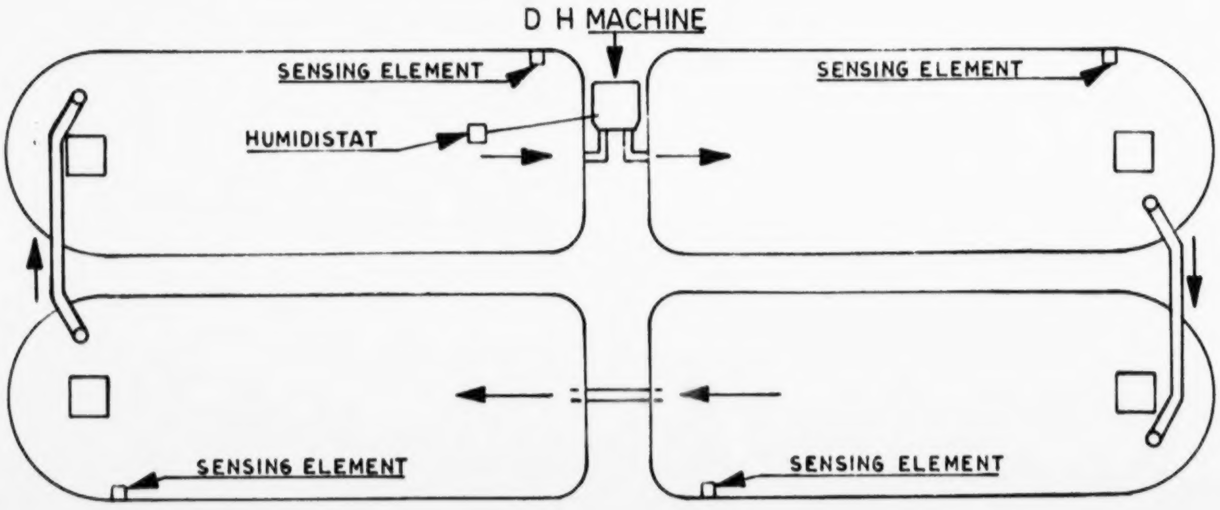
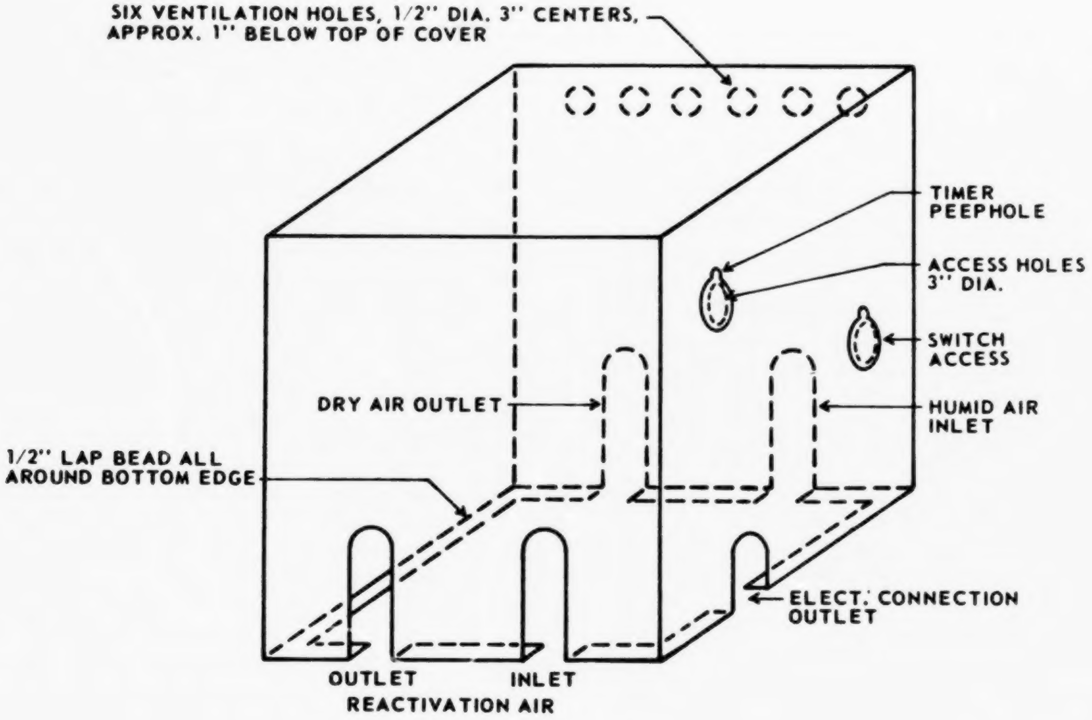
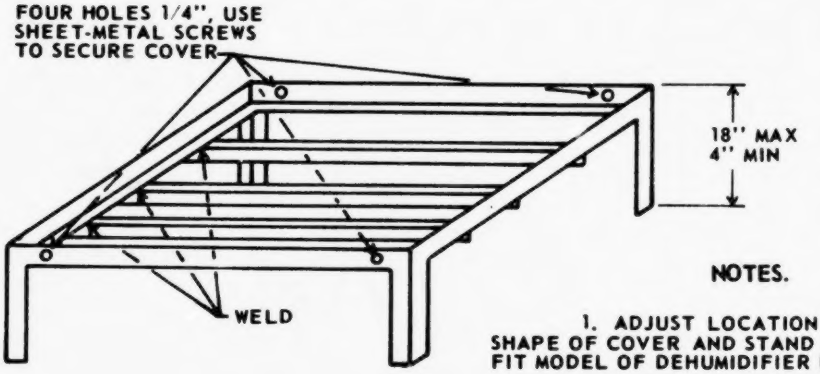


Figure 35. Dehumidification system for LARC V design 8005.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 36. Typical cover and stand for dehumidifier.

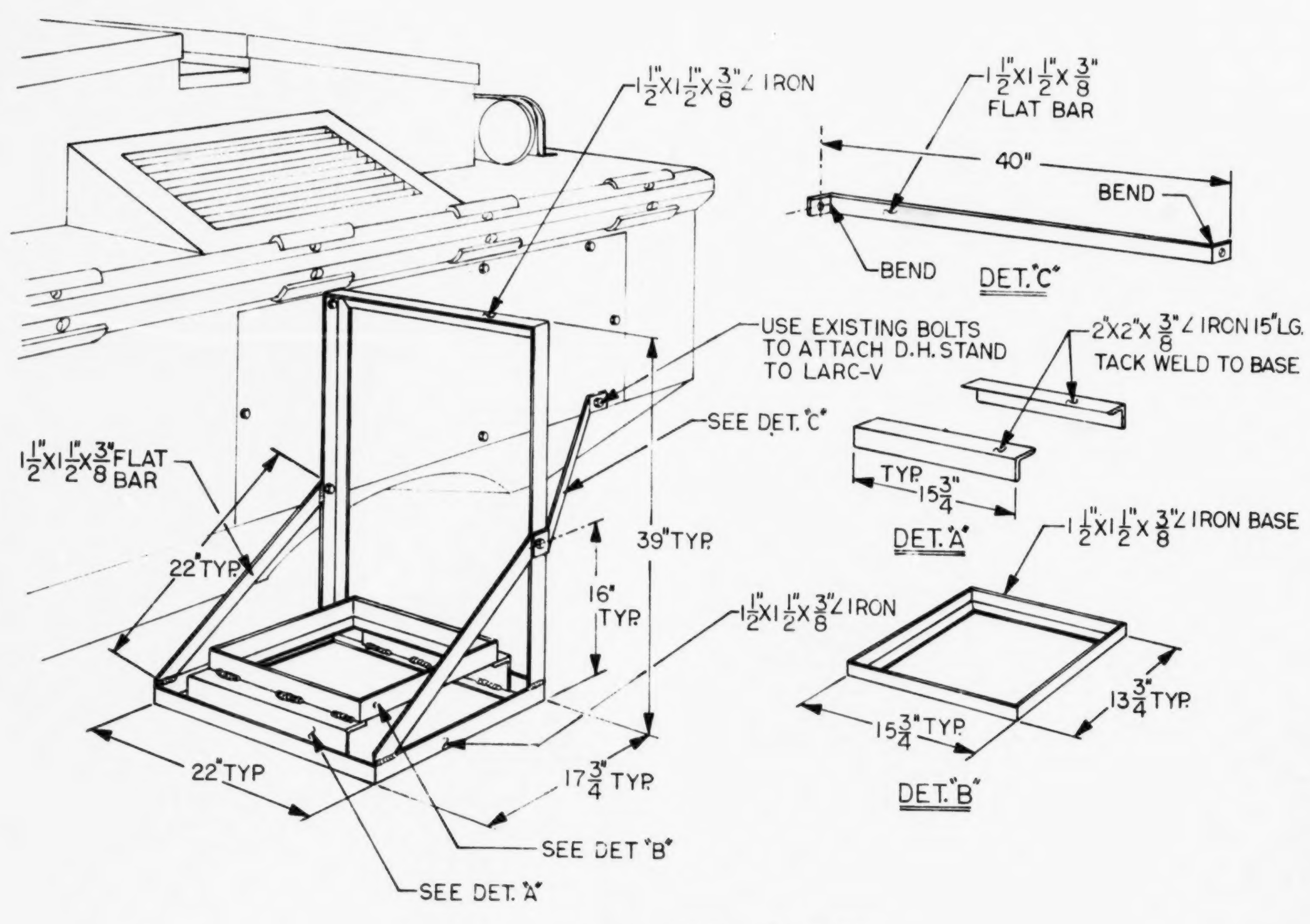

$1\frac{1}{2}$"X$1\frac{1}{2}$"X$\frac{3}{8}$" ∠ IRON
$1\frac{1}{2}$"X$1\frac{1}{2}$"X$\frac{3}{8}$"
FLAT BAR
40"
BEND
BEND
DET."C"
USE EXISTING BOLTS
TO ATTACH D.H. STAND
TO LARC-V
2"X2"X$\frac{3}{8}$" ∠ IRON 15"LG.
TACK WELD TO BASE
SEE DET."C"
$1\frac{1}{2}$"X$1\frac{1}{2}$"X$\frac{3}{8}$"FLAT BAR
TYP.
$15\frac{3}{4}$"
DET."A"
$1\frac{1}{2}$"X$1\frac{1}{2}$"X$\frac{3}{8}$" ∠ IRON BASE
22"TYP.
39"TYP.
16"
TYP.
$1\frac{1}{2}$"X$1\frac{1}{2}$"X$\frac{3}{8}$" ∠ IRON
$13\frac{3}{4}$"TYP.
$15\frac{3}{4}$"TYP.
22"TYP
$17\frac{3}{4}$" TYP.
DET."B"
SEE DET "B"
SEE DET. "A"

Figure 37. Bolt on type D.H. stand for LARC V.

APPENDIX K

DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR LIGHTER, AMPHIBIOUS (LARC-XV), SELF-PROPELLED, ALUMINUM, 15-TON, DESIGN 8004

1. General. This appendix provides detailed instructions for preparation of the amphibious lighter (LARC-XV), design 8004, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) Remove weather exposed horns, range light, and windshield wiper blades and arms, tag, package fragile items in fiberboard boxes, and stow in operator's cab.

(2) Remove life ring and life ring line holding strap, bag, tag for identification; and stow in operator's CAB.

(3) Remove compass, life preserver, spotlights, trouble lights, and bulwark panels; individually package in fiberboard boxes, identify, and stow in transmission compartment.

(4) Remove antenna and stow in forward hatch.

(5) Plastic bubble dome. The plastic dome shall be removed, identified to the hull number from which removed, tagged for identification, packed to prevent damage, and stored in a protected location, warehouse preferably.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The cab, engine compartment, and the differential and transfer transmission area will be prepared for dehumidification.

(2) *Provisions for ventilation and air circulation.*

(a) Method 1 (fig 38). The quick opening hatch leading into the transfer transmission area, the starboard side engine hatch cover on the lighter, from which the moist air is returned, and the port engine hatch cover of the lighter, where the dry air is introduced, will be removed and stowed in the cab. The resulting openings will be covered with blanks fabricated from exterior grade plywood or sheet metal. All blanks, except the one over the dry-air inlet, will be provided with two holes: One for a four-inch duct for passage of air; and one for mounting of a sensing element. The blank over the moist-air outlet will be provided with one additional hole to receive a humidistat cable.

(b) Method 2 (fig. 39). Fabricate and install No. 20 gage galvanized sheet metal covers over upper and lower fan drive compartments grills and secure in place by use of existing grill bolts. Provide a 3-inch hole and slip joint connection, one blank for lower grill of each lighter for dry-air D H ducting. Remove the two adjacent fuel oil filler caps, bag with attaching screws, tag for identification, and stow in operator's cab. Fabricate No. 26-gage galvanized sheet metal, 90° angle adapters for ducting cross-connection between lighters. Remove hose from hydraulic, bilge pump, suction pipe to provide opening to hull interior for installation of humidity sensing elements.

NOTE

Blanks and panels fabricated from sheet metal dissimilar to the lighter hull will be coated or otherwise insulated at points of contact with hull. To permit maximum circulation of air within the dehumidified zones, all manhole covers, handhole covers, and inspection plates on equipment located in dehumidified areas will be removed and secured in other than normal position. The hatch cover and inspection plates located in the floor of the cab will be secured in an open position.

(3) *Sealing for dehumidification.* Materials and methods used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) Hull openings. Pump outlets and all other openings found to be a source of leakage will be sealed with pressure-sensitive tape, strippable compound, and bituminous coating.

(b) Exhaust pipes. Exhaust pipes will be plugged and sealed with strippable coating to prevent passage of air.

(c) Cab openings. Fabricate and install No 20 gage galvanized sheet metal covers or plywood over the cab windows and coaming resulting from

the removal of the plastic bubble dome. Use existing plywood blanks on dome coaming where in serviceable condition; apply wood preservative and completely coat with strippable compound.

(d) Miscellaneous sealing. Edges of doors, windows, hatch covers, and all other openings in the nature of seams or joints between closely opposed surfaces which access to dehumidified area, including bilge plug openings, will be sealed with strippable coating and bituminous coating.

(e) Dehumidification piping system. The points of entry of all air ducts into compartment and the connecting joints of all air ducts will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the tubing or ducts.

(4) *Installation of dehumidification system.* Normally a dynamic dehumidification system will be installed for each group of two lighters to provide dynamic dehumidification of the cab, engine compartment, and the differential and transfer transmission area. When dynamic dehumidification of the lighters is accomplished on an individual basis, installation of the dynamic dehumidification system will be in accordance with this bulletin.

(a) Dehumidification machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic feet capacity, 110-volt, alternating-current, will be installed as shown on figures 38 and 39. The machine will be mounted on a stand and protected with a cover, fabricated in accordance with figure 40.

1. The machine will be installed on the engine hatch cover (for lighters, stored as shown in figure 38) in a manner to require a minimum of turns in the ductwork and will be secured in place to prevent movement.

2. For lighters, stored as shown in figure 39, the machine will be mounted on a stand at lighters' stern; the stand will be secured in place, with existing bolts in position, to provide the most direct connection for opening to ducting connection in metal blank on radiator grill. Dimensions shall be taken from hull. The machine stand will be fabricated, generally, in accordance with figure 41 and protected with a cover, fabricated in accordance with figure 40.

(b) Machine connections. Connection of ducts to the dehumidification machine will be made of unions or slip joint connections, which permit easy removal of the machine for servicing.

(c) Duct installation. Four-inch-diameter, No. 26 gage, galvanized tubing, with necessary ells, reducing fittings and connections, will be installed, generally, as shown on figure 38 or 39. Flanges of galvanized metal will be joined to the ductwork to attach it to openings in the blanks prepared for its entrance into the lighter. The flanges will be constructed with collars or suitable tabs to resist dislodgement from the blank openings. Ductwork will be supported, as necessary, by use of wooden or metal A-frames or other structures.

(d) Humidistat. A hair-type humidistat will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified areas. The humidistat will be installed, approximately three feet above the floor plate, in the compartment of the lighter, from which moist air is ducted back to the dehumidification machine. A bracket will be provided to retain the humidistat. The humidistat will be wired to the dehumidifier with No. 18, two-conductor, rubber covered cable. The cable will follow the moist-air return ducting for support and shall penetrate the hull through blank, as shown in figures 38 and 39.

(e) Humidity sensing elements. Humidity sensing elements will be installed in the blanks for lighters, stored as shown in figure 38. For lighters, stored as shown in figure 39, the sensing elements will be installed in one of each hydraulic, bilge pump, overboard discharge, hull fitting, as shown in figure 39. The humidity sensing element will be held in place by a fabricated adapter plate.

c. Preparation of Rubber Tires for Storage.

(1) *Blocking lighters during storage.* Lighters will not require blocking during storage. Pneumatic tires will be inflated to 30 pounds per square inch.

(2) *Protection of tires during storage.* Lighters stored in open areas or shed storage in excess of 90 days will have the tires protected as specified below:

(a) Installed pneumatic and semi-pneumatic tires, manufactured from natural or synthetic compounds or a combination thereof, will be protected during storage by inclosing tires and wheels within protective polyethylene bags, as outlined in Specification MIL-T-46755 (MO).

(b) Tires identified as manufactured with OZ compounds (as illustrated in fig. 2 of MIL-T-46755(MO)) do not require additional protection until 2 years from the date of manufacture. After 2 years from the date of manufacture, tires will be protected as specified in (a) above.

(c) When a lighter is equipped with a

combination of NON-OZ and OZ tires less than 2 years old and any tire 2 years old or older, all tires in the lighter will be protected during storage as specified in (a) above.

(3) *Preparation prior to placing bag over tire and wheel assembly.*

(a) *Slack allowance.* Lighters will be raised for installation of bags. Care will be taken to assure that sufficient slackness is left in the bottom of the bags when the lighter is lowered to the ground. The bag will be positioned in a manner which will prevent obstruction of drain holes when bag contacts ground surface. If the enclosed tires and wheels are to be stored on gravel, turf, or unpaved areas, a piece of fiberboard or other suitable material, of sufficient size, will be placed on the ground surface under the bag to prevent rupturing the bag.

(b) *Cleaning.* Prior to installation of the polyethylene bag, each tire and wheel assembly will be cleaned in accordance with process C-1 of MIL-P-116 to insure removal of all foreign objects imbedded or lodged in tire treads. Tires will be thoroughly dried in accordance with any applicable drying process of MIL-P-116.

(4) *Installation of bags.* Polyethylene bags will be placed over the tire and wheel assembly and positioned in a manner that will permit securing to axles. Excess material at the bag opening will be folded and formed to the contour of, and against the axle assembly. Bag will then be secured to the axle assembly, using rope conforming to class 2, size (circumference) 5/8-inch of T-R-571. Corners of the bag will be folded against the installed bag and secured in that position with tape conforming to type IV of PPP-T-60.

(a) *Drain holes.* Two drain holes, approximately ¼ inch in diameter, will be provided in each bag. Drain holes shall be positioned at the lowest point of the installed bag, as illustrated in figure 3 of MIL-T-46755(MO).

(b) *VCI application.* Crystalline volatile corrosion inhibitor (VCI) or treated carrier type VCI will be used within each polyethylene bag. When crystalline VCI is used, it will conform to type I of MIL-I-22110, dicyclohexyl ammonium nitrite formulation, FSN 6850-368-5233. Twenty grams will be blown into the polyethylene bag by any suitable means. When treated carrier VCI is used, it will conform to type I, class 2, style B of MIL-I-3420, dicyclohexyl ammonium nitrite formulation, NSN 8135-00-664-4012. One strip, 12 inches wide, and length equal to the circumference of the tire plus 2 inches, will be placed around the circumferences of the tire, VCI side out, per polyethylene bag and will be secured in place with tape conforming to type IV of PPP-T-60.

(5) *Surveillance of bagged tires.* Periodic surveillance of storage areas, where lighters containing bagged tires are stored, will be maintained to determine condition of bags. When bags are loosened due to severe wind storms, the bags will be retightened at the ties. All small tears will be sealed with tape conforming to type IV of PPP-T-60. If severe damage occurs, the tire bag will be replaced.

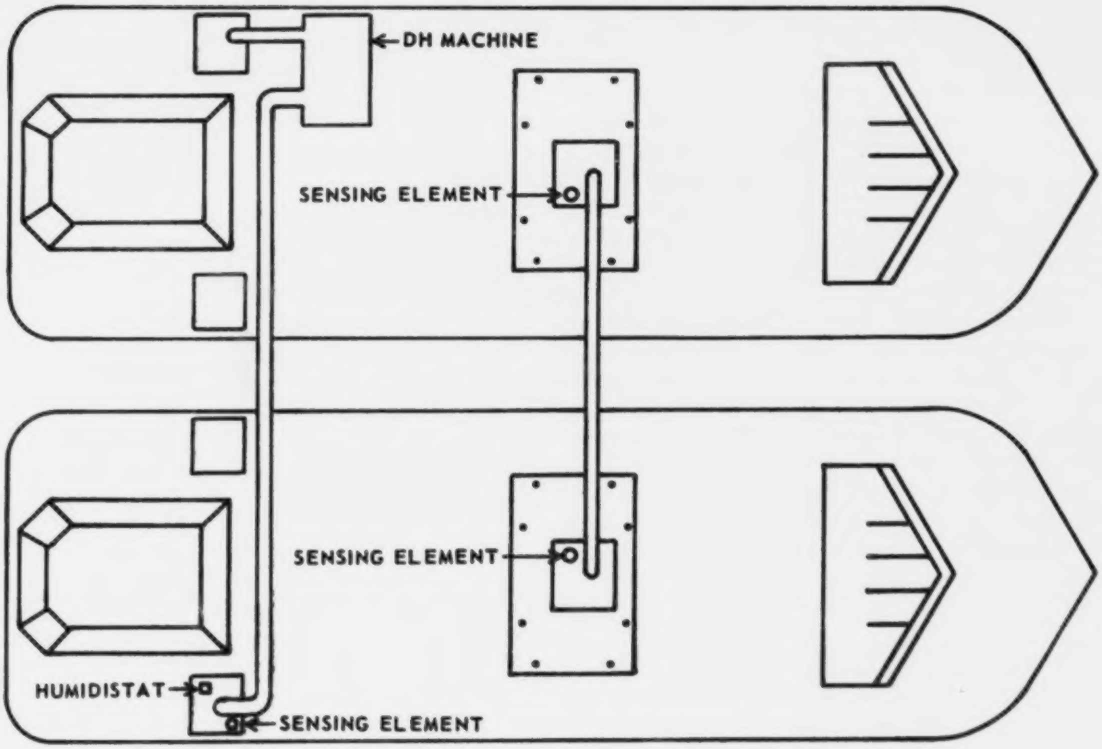


Figure 38. Dehumidification system for LARC XV design 8004.

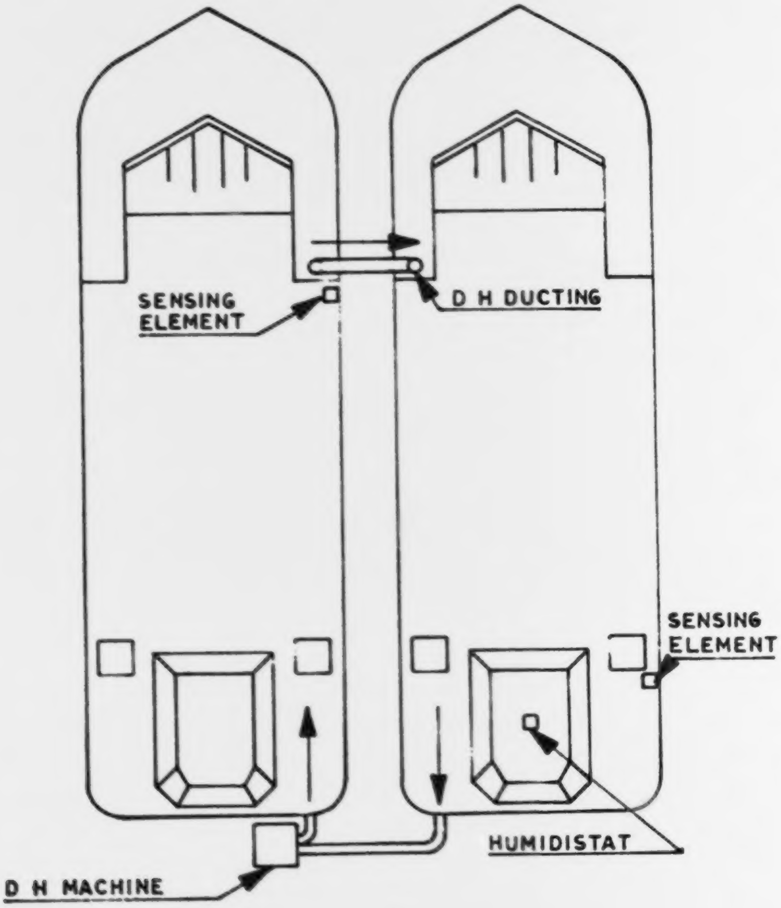
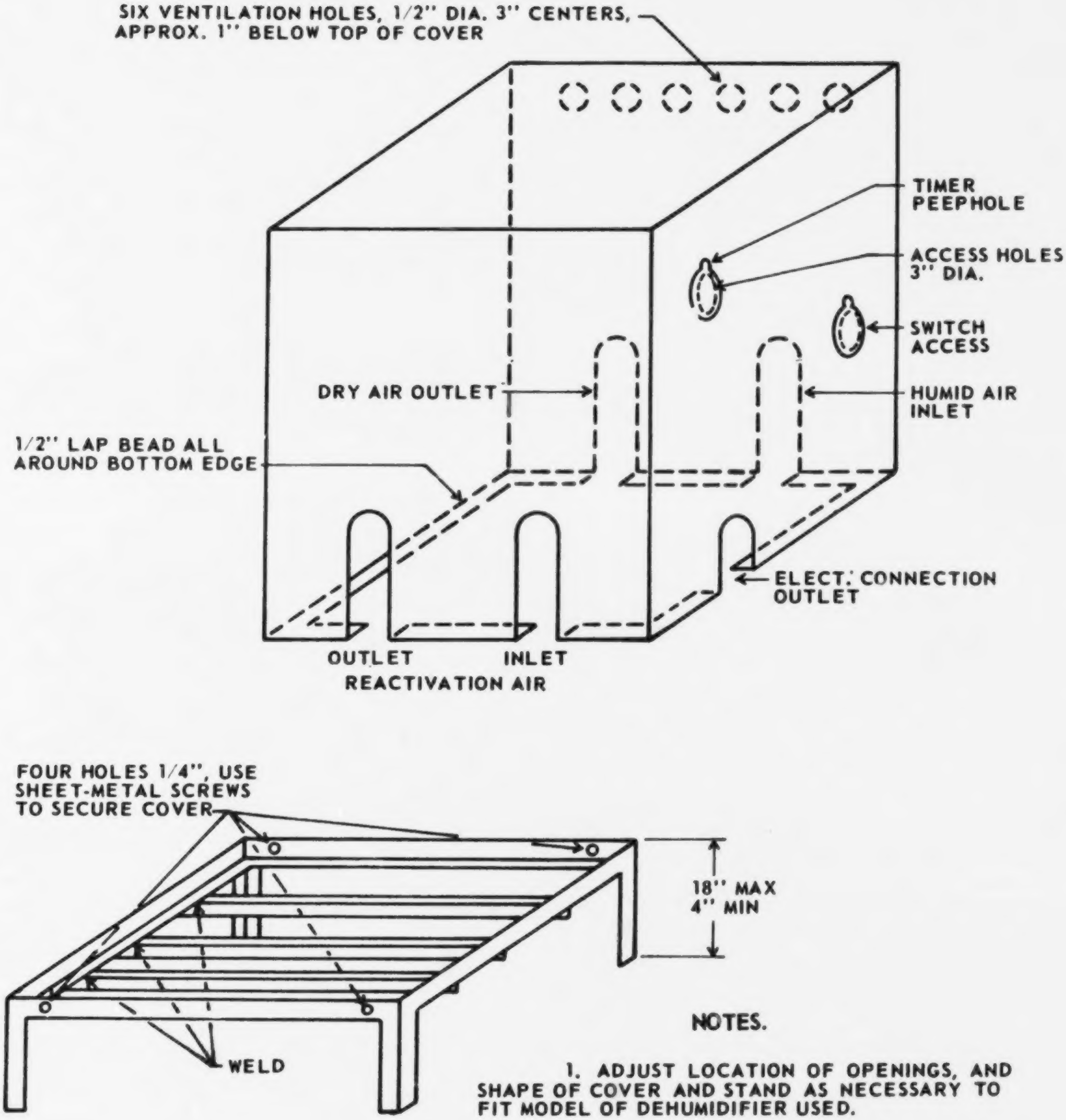


Figure 39. Dehumidification system for LARC XV design 8004.


SIX VENTILATION HOLES, 1/2" DIA. 3" CENTERS, APPROX. 1" BELOW TOP OF COVER
TIMER PEEPHOLE
ACCESS HOLES 3" DIA.
SWITCH ACCESS
DRY AIR OUTLET
HUMID AIR INLET
1/2" LAP BEAD ALL AROUND BOTTOM EDGE
ELECT. CONNECTION OUTLET
OUTLET
INLET
REACTIVATION AIR
FOUR HOLES 1/4", USE SHEET-METAL SCREWS TO SECURE COVER
18" MAX
4" MIN
WELD

NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 40. Typical cover and stand for dehumidifier.

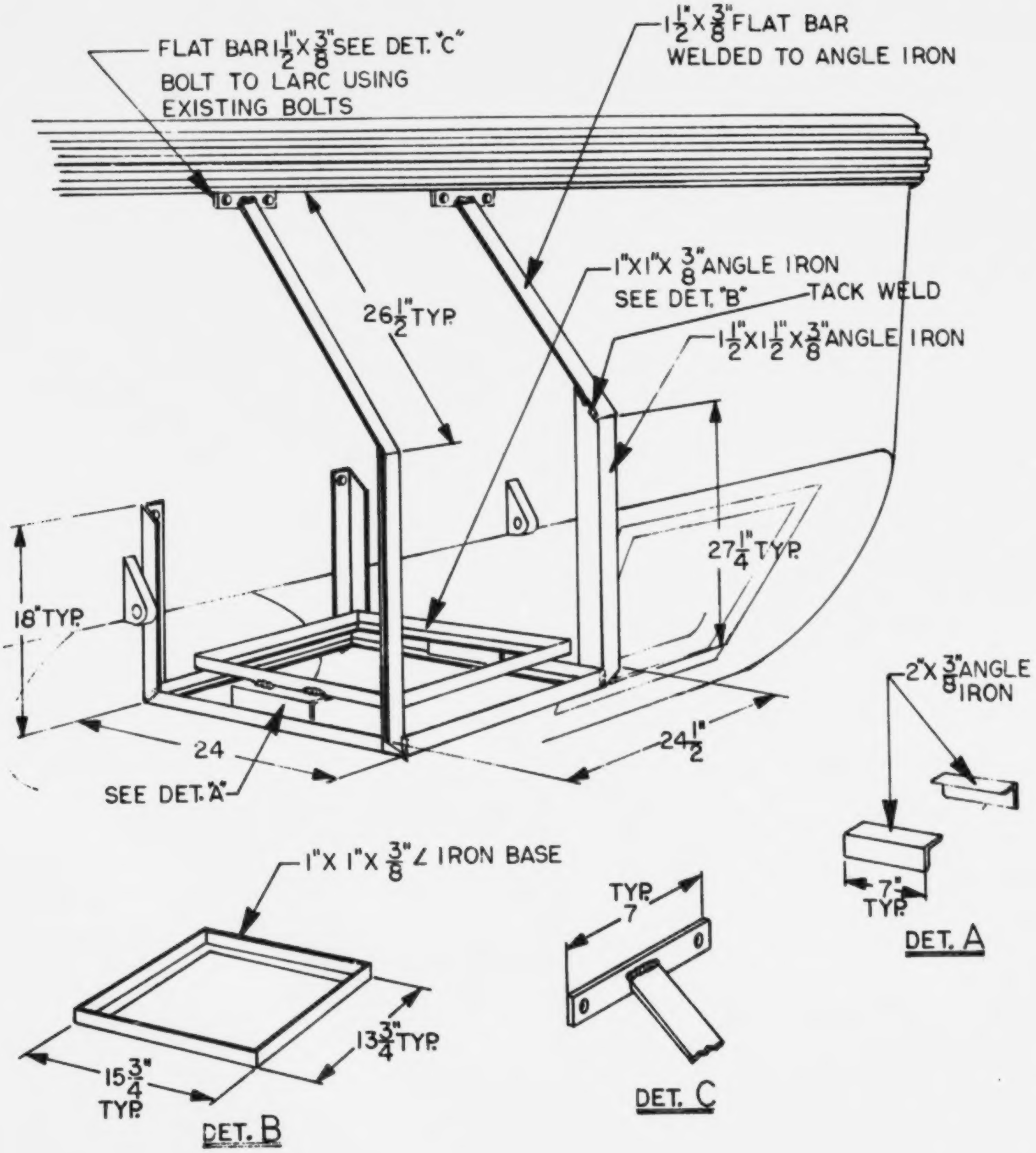


Figure 41. Bolt on type D. H. stand for LARC XV.

APPENDIX L
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR LIGHTER, AMPHIBIOUS: SELF-PROPELLED DIESEL, STEEL, 60-TON, 61-FOOT, (LARC-LX), DESIGN 2303

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1. General. This appendix provides detailed instructions for preparation of the amphibious lighter (LARC-LX), design 2030, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Mooring lines.* Remove, coil, and stow in starboard aft wing compartments.

(2) *Boat hook.* Stow in clips provided on the after side of cargo well aft bulwark.

(3) *Life preservers.* Stow in starboard aft wing compartment.

(4) *Lifting slings.* Stow in cargo well.

(5) *Searchlight.* Remove, package in a fiberboard box, identify, and stow in the cab.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The engine compartments, machinery compartments, and the cab will be prepared for dehumidification.

(2) *Provisions for ventilation and air circulation.* The engine compartment vent, forward of the operator's cab, will be removed and stowed in the engine compartment on the starboard side. The resulting opening in the deck will be covered with a blank fabricated from exterior grade plywood or galvanized sheet metal. The blank will be provided with holes of suitable size for the introduction of two, 4-inch, air ducts, one sensing element, and one electrical fitting for a humidistat. The manhole access plates in the cargo wells on the port and starboard sides will be removed and stowed in the engine compartment on the starboard side. The resulting openings will be covered with blanks fabricated from exterior grade plywood or galvanized sheet metal. The blanks will each be provided with holes of sufficient size for the introduction of two, 4-inch, air ducts and one sensing element. The starboard engine radiator vent will be removed and stowed in the engine compartment on the starboard side. The resulting opening will be covered with a blank fabricated from exterior grade plywood or galvanized sheet metal. The blank will be provided with a hole of sufficient size for the mounting of a sensing element. The port side, aft end, machinery compartment vent will be removed and stowed in the engine compartment on the starboard side. The resulting opening will be covered with a blank fabricated galvanized sheet metal. Strap- and plate-type starter housing covers will be secured in other than normal position to permit circulation of air.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) Hull openings. Pump outlets and fuel tank vents will be sealed with pressure-sensitive tape, strippable compound, and bituminous coating.

(b) Exhaust pipes. Exhaust pipes will be plugged and sealed with strippable coating to prevent passage of air.

(c) Dehumidification piping system. The connecting points of all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All joints and seams in the ducts will be similarly sealed.

(d) Miscellaneous sealing. Edges of doors, windows, hatches, hoods, ventilation openings having installed covers, and all other openings in the nature of seams or joints between closely opposed surfaces will be sealed with strippable coating and bituminous coating.

(e) Cab. Opening in the cab, caused by removal of the searchlight, will be sealed with pressure-sensitive tape and strippable coating.

(4) *Installation of dehumidification system.*

(a) Dehumidification machines and duct installation. Two package dehumidifiers, single desiccant bed, absorbent type, 10,000 cubic foot

capacity, 110-volt, alternating-current, will be installed on the aft deck, port side, as shown on figure 42. The machines will be mounted on a stand and protected with a cover, fabricated, generally, in accordance with figure 43. Four-inch, No. 26 gage, galvanized tubing will be installed, leading from the dehumidification machines into plates over the No. 3 and No. 4 engines radiator access holes to vent petcocks. The inspection plates (No. 38-3 and No. 38-4) to the two radiators will be removed, and two flexible 4-inch-diameter hoses, one through each inspection plate opening, will be extended to the farthest point on the port side aft of the lighter. The manhole plate between the aft compartment and the machinery compartment on the starboard side aft will be removed and secured adjacent to place of use. The manhole plate between the machinery compartment and bilge pump compartment on the starboard side forward will be removed and secured adjacent to place of use. Two, 4-inch-diameter, No. 26 gage, galvanized tubings will be installed in the blanks over the lifting eyes in the cargo well, as shown on figure 42. The tubings will run from starboard side to port side of the lighter. Four-inch-diameter flexible hoses leading from the cargo well blanks will be extended to the farthest point forward on both sides of the lighter. The manhole plate between port machinery and bilge pump compartments will be removed and secured adjacent to place of use. Two, 4-inch-diameter, No. 26 gage, galvanized tubings will be installed in the blank over the engine compartment vent forward of the operator's cab as shown on figure 42. The tubings will run from the blank to the dehumidification machines.

(b) Machine connections. Connection of ducts to the dehumidification machines will be made of unions or slip joint connections, which permit easy removal of the machines for servicing.

(c) Humidistat. A hair-type humidistat will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified areas. The humidistat will be installed in the blank over the port side aft and the machinery house compartment vent opening. The humidistat will be installed in a way that it will control the two dehumidification machines. It will be wired to the machines with No. 18, two-conductor, rubber covered cable.

(d) Humidity sensing elements. Four humidity sensing elements will be installed on each lighter, as shown on figure 42, and as outlined in *1* through *3* below:

1. Starboard engine radiator vent. One sensing element will be installed in the blank covering the radiator vent.

2. Manhole access plates. Two sensing elements with cables will be installed in the blanks covering the manhole access openings (one in each blank). The cables will extend up to walkways.

3. Engine compartment vent. One sensing element will be installed in the blank covering the engine compartment vent forward of the operator's cab.

c. Preparation of Rubber Tires for Storage.

(1) *Blocking lighters during storage.* Lighters will require blocking during storage. Pneumatic tires will be inflated to normal operating pressure.

(2) *Protection of tires during storage.* Lighters stored in open areas or shed storage in excess of 90 days will have the tires protected as specified below:

(a) Installed pneumatic and semi-pneumatic tires, manufactured from natural or synthetic compounds or a combination thereof, will be protected during storage by inclosing tires and wheels within protective polyethylene bags as outlined in Specification MIL-T-46755(MO).

(b) Tires identified as manufactured with OZ compounds (as illustrated in fig. 2 of MIL-T-46755/MO)) do not require additional protection until 2 years from date of manufacture. After 2 years from the date of manufacture, tires will be protected as specified in (a) above.

(c) When a lighter is equipped with a combination of NON-OZ and OZ tires less than 2 years old and any other tire 2 years old or older, all tires on the lighter will be protected during storage as specified in (a) above.

(3) *Preparation prior to placing bag over tire and wheel assembly.* Prior to installation of the polyethylene bag, each tire and wheel assembly will be cleaned in accordance with process C-1 of MIL-P-116 to insure removal of all foreign objects imbedded or lodged in tire treads. Tires will be thoroughly dried in accordance with any applicable drying process of MIL-P-116.

(4) *Installation of bags.* Polyethylene bags will be placed over the fire and wheel assembly and positioned in a manner that will permit securing to axles. Excess material at the bag opening will be folded and formed to the contour of, and against, the axle assembly. Bag will then be secured to the axle assembly, using rope conforming to class 2, size (circumference) 5/8-inch, of T-R-571. Corners of the bag will be folded against the installed bag and secured in that

position with tape conforming to type IV of PPP-T-60.

(a) *Drain holes.* two drain holes, approximately ¼ inch in diameter, will be provided in each bag. Drain holes will be positioned at the lowest point of the installed bag, as illustrated in figure 3 of MIL-T-46755(MO).

(b) *VCI application.* Crystalline volatile corrosion inhibitor (VCI) or treated carrier type VCI will be used within each polyethylene bag. When crystalline VCI is used, it will conform to type I of MIL-I-22110, dicyclohexyl ammonium nitrite formulation, NSN: 6850-00-368-5233. Twenty grams will be blown into the polyethylene bag by any suitable means. When treated carrier VCI is used, it will conform to type I, class 2, style B, of MIL-I-4012. One strip, 12 inches wide, and length equal to the circumference of the tire plus 2 inches, will be placed around the circumferences of the tire, VCI side out, per polyethylene bag and will be secured in place with tape conforming to type IV of PPP-T-60.

(5) *Surveillance of bagged tires.* Periodic surveillance of storage areas, where lighters containing bagged tires are stored, will be maintained to determine condition of bags. When bags are loosened due to severe wind storms, the bags will be retightened at the ties. All small tears will be sealed with tape conforming to type IV of PPP-T-60. If severe damage occurs, the tire bag will be replaced.

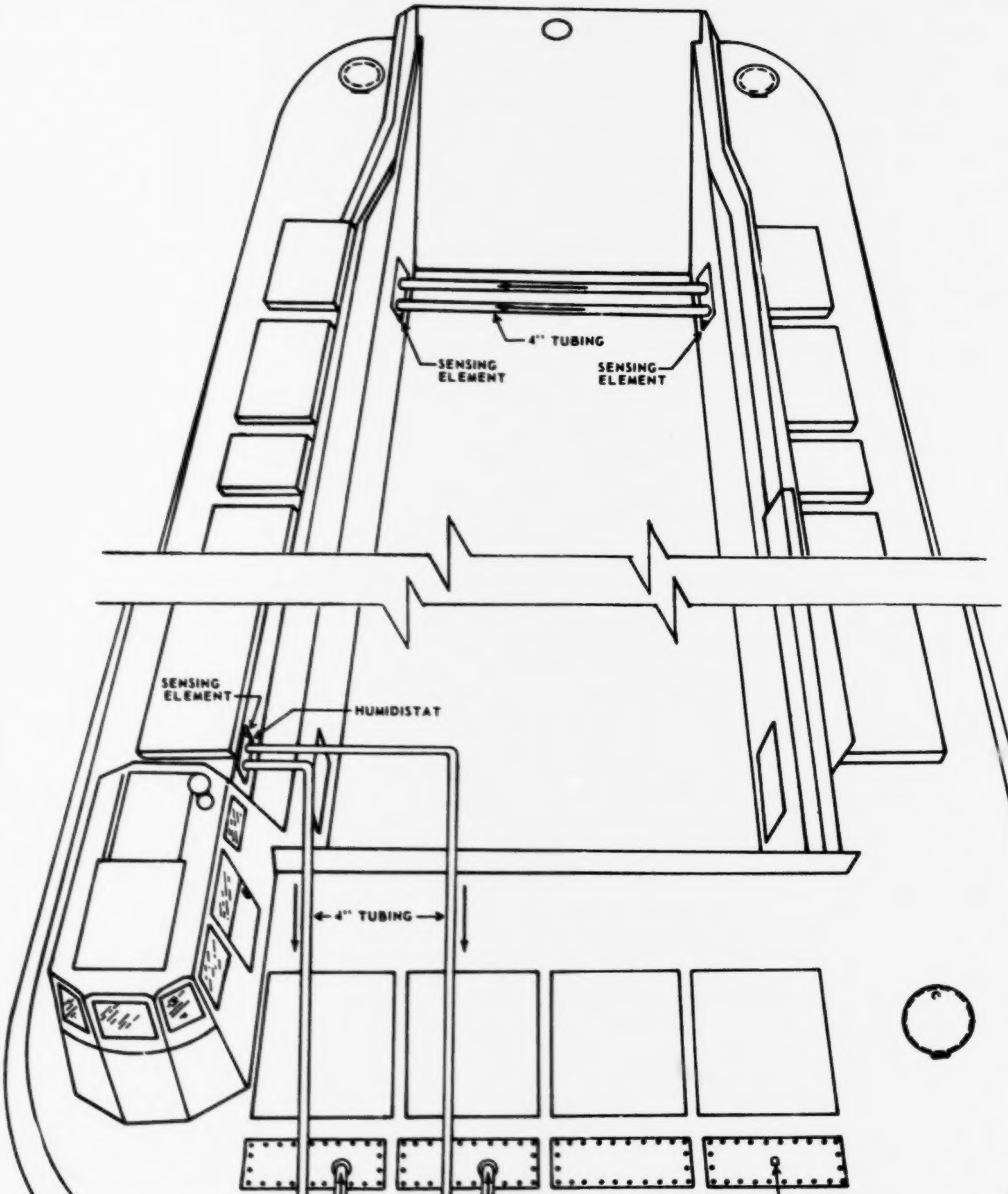
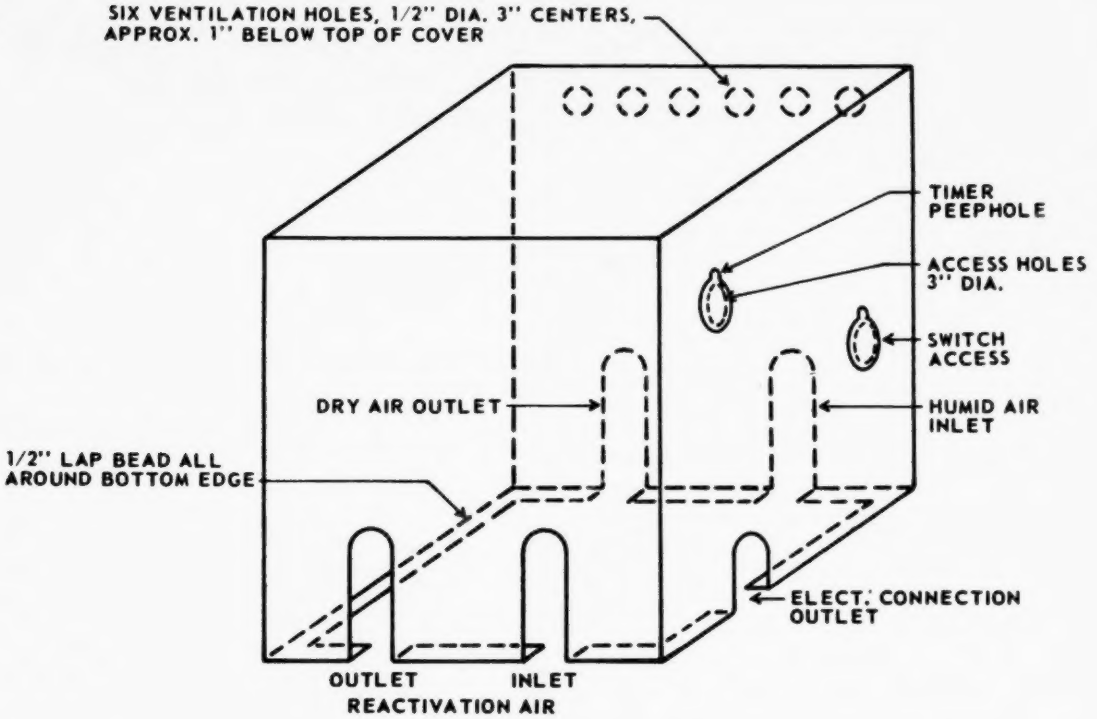
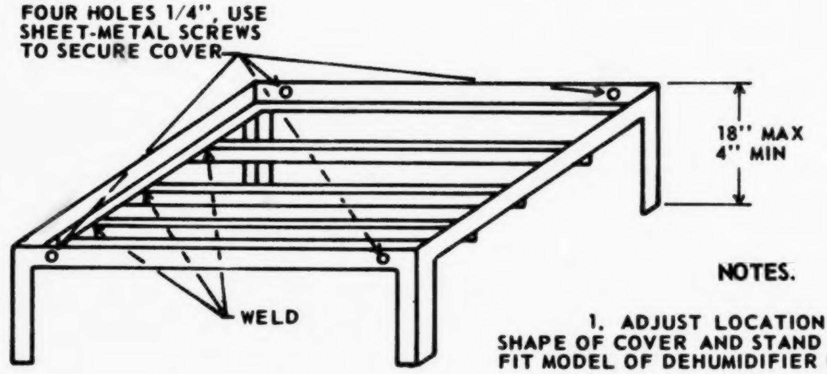


Figure 42. Dehumidification system for LARC LX design 2303.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 43. Typical cover and stand for dehumidifier.

APPENDIX M
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR CRANE, FLOATING, REVOLVING, DIESEL, ELECTRIC 100-TON, DESIGN 264B

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1. General. This appendix provides detailed instructions for preparation of the floating crane, design 264B, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Engineroom.* The following items will be removed, identified, and stowed in the engineroom:

(a) Fire pump hose.

(b) Fire pump and control box.

(c) Heating boiler exhaust stack.

(2) *Galley.* The following items will be removed, identified, and stowed in the galley:

(a) Mushroom vent for the galley.

(b) Galley stove exhaust pipe.

(c) All canvas covers.

(3) *Machinery house.* The following items will be removed, identified, and stowed in the machinery house:

(a) Boom limit switches.

(b) Boom lights.

(c) Floodlights.

(d) Navigation lights.

(e) Ship's bell.

(f) Horn.

(g) Turning alarm.

(h) Windshield wipers.

(i) Machinery house door.

(4) *Anchor chains.* The anchor chains will be detached from the anchors and stowed in the chain locker.

(5) *Anchor.* The anchors will be mounted on chocks and secured on the forward deck.

(6) *Boom.* The boom will be secured in the A-frame.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The galley, berthing space, engineroom, crane cab, windlass, and capstan machinery spaces will be prepared for dynamic dehumidification.

(2) *Provision for air circulation and moisture diffusion.* To permit maximum circulation of air within the dehumidified zones, all interior doors, including cabinet doors, panel doors, refrigerator doors, controller doors, and doors on similar items, will be secured in an open position. Manhole covers, handhole covers, and inspection plates on equipment located in dehumidified areas will be removed and secured in other than operating position. The hatch covers in the galley and berthing space that lead to the storage area below will be secured in partially open position. The capstan motors, the motor reducers, and the controller panels, located in the void spaces below the capstans, will be opened to the circulation of dehumidified air by the removal of inspection plates and the opening of the panel doors. Connections to and from the crane fuel oil tank will be broken and left open. All doors and inspection plates on the heater will be secured in a open position to permit circulation of air.

(3) *Sealing for dehumidification.* Materials and methods used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) Capstans and capstan controllers. The openings between the capstan heads and the capstan pedestals and the joint at the pedestals and the deck will be sealed with strippable coating and bituminous coating. Pressure-sensitive tape will be utilized, if necessary, to bridge openings, prior to the application of the strippable coating and the bituminous coating. The opening on the capstan control boxes and the openings at the joint where the control cables pass through the deck will be sealed with strippable coating and bituminous coating. The underside of the towing lug pins, the slotted openings at the bulkhead, in way of the transverse deck framing, and the floor drain openings in the forward compartment will be sealed with strippable coating.

(b) Windlass cover. A cover will be fabricated and installed over the anchor windlass and the windlass controller. The cover will be fabricated from minimum No. 18 gage galvanized sheet metal. All top and vertical edges will be reinforced by 1- x 1- x1/8-inch-angle irons. A coaming of 1-x 1-x 1/8-inch-angle iron will be tack

welded to the deck around the windlass. The angle irons will be positioned with one face against the deck and the vertical face toward the windlass. The size and shape of the coaming will be such that the sheet metal cover fits snugly over the vertical faces. The cover will be fastened to the coaming by No. 12 sheet metal screws spaced approximately 2 feet apart. The cover will be provided with two holes, of sufficient size, to introduce the dry-air duct and the moist-air return duct and one hole, of sufficient size, to mount a sensing element. Apertures between the coaming and the deck will be filled with bituminous coating. All other joints and seams will be coated with strippable coating and bituminous coating.

(c) Skylight. The skylight will be closed, and the joint between the skylight hose and the movable sections will be sealed with strippable coating and bituminous coating. The skylight glasses and frame will be sealed at the edges with strippable coating and bituminous coating.

(d) Galley and engineroom accesses. The sliding covers and doors to the galley and the engineroom will be sealed with strippable coating and bituminous coating. The portlights in the engineroom and the galley casings, except those used to introduce dehumidification ducts, will be sealed with strippable coating and bituminous coating. The ventilators and the exhause pipes will be blanked and sealed above the deck.

(e) Machinery house. The machinery house windows will be covered with blanks fabricated from exterior grade plywood or galvanized sheet metal and sealed with strippable coating and bituminous coating. The access hatch on the roof of the machinery house will also be sealed with strippable coating and bituminous coating. The cable openings in the machinery house roof will be blanked and sealed with strippable coating and bituminous coating. One door to the machinery house will be removed, and the opening covered with a blank fabricated from minimum ¾-inch exterior grade plywood or minimum No. 18 gage galvanized sheet metal. The blank will be sealed with strippable coating and bituminous coating.

(f) Miscellaneous sealing. The lube oil overboard discharge line on top of the engineroom casing, the fuel oil valve, the fuel tank vent, the fire pump receptacle, the shore power receptacle, the window drain holes, adn openings resulting from the removal of windshield wipers, lights, and other such items will be sealed with strippable coating and bituminous coating.

(g) Sealing of dehumidification piping system. The connecting points of all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All joints and seams in the ducts will be similarly sealed.

(4) *Dehumidification installation.*

(a) Dehumidification system No. 1. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current, will be installed, generally, as shown on figure 44. The machine will be mounted on a stand and protected with a cover, fabricated in accordance with figure 46. An extension, terminating in a 90° elbow will be fitted to the reactivation air outlet on the dehumidification machine in order to extend the outlet beyond the exterior side of the sheet metal cover. The elbow will be turned away from the reactivation air inlet side and turned downward 45° to prevent the direct entry of water. Four-inch-diameter, No. 26 gage, galvanized sheet metal ducts, with necessary ells, reducing fittings and connections, will be installed, generally, as shown on figure 44. A portlight on the starboard side and one on the port side of the engineroom casing facing the stern will be secured in open position, and the openings covered with blanks fabricated from exterior grade plywood or galvanized sheet metal. The blank for the port side portlight will be provided with a hole of sufficient size to introduce the dry-air duct. The blank for the starboard side portlight will be provided with three holes: One, of sufficient size, to introduce the moist-air return duct; another to permit the passage of the humidistat cable; and the third to mount the sensing element contact. A flexible hose, conforming to MIL-Spec H-8796, will be run from the moist-air return fitting in the starboard side blank and will terminate approximately 3 feet from the forward starboard engineroom bulkhead and no more than 18 inches above the engineroom deck. A humidistat, electronic-type, will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified area. The humidistat will be installed approximately 3 feet above the engineroom deck and at a distance approximately 3 feet from the intake end of the flexible base. Two humidity sensing elements, with 6-foot cable, will be installed in the engineroom. One will be installed in the aft section of the starboard engineroom. The contact will be mounted in the blank used to introduce the moist-air return duct. The end portlight on the forward starboard side of the engineroom casing will be secured in

open position and a blank, similar to those used to introduce the air ducts, will be installed over the opening. The blank will be provided with a hole of sufficient size to mount a sensing element contract. The second sensing element will be secured in the forward section of the port side engineroom, and the contact will be mounted in the portlight blank.

(d) Dehumidification system No. 2. A dehumidification machine and ductwork, similar to that specified in (a) above, will be installed, generally, as shown on figure 44. The machine will be mounted on a stand and protected with a cover, fabricated in accordance with figure 46. The first portlight inboard of the starboard side in the forward end of the galley casing, the portlight in the forward port side section of the casing, and the portlight in the after port side seciton of the casing, will be secured in open position. Blanks, similar to those specified in (a) above, will be installed over the openings. The blank in the starboard portlight will be provided with a hole sufficient to mount a sensing element contact. A flexible hose, similar to that specified in (a) above, will be run from the moist air return duct, in the port side portlight, down through the hatch to the storage space below the galley. The hose will terminate no more than 18 inches above the storage space deck. A sensing element will be installed in the side of the return air duct, approximately 6 inches outside the blanked portlight. The hatch to the capstan machinery compartment will be secured in open position. A blank will be fabricated from exterior grade plywood or galvanized sheet metal and secured over the hatch opening. The blank will be provided with three holes: One for the air duct from the galley casing; the second for the return air duct to the windlass; and the third for the passage of the humidistat cable. Flexible hose, similar to that specified in (a) above, will be connected to the moist-air return fitting in the blank. The flexible hose will run from the blank and will terminate approximately 3 feet from the forward bulkhead of the capstan machinery compartment and no more than 18 inches above the floor plates. A humidistat, similar to that specified in (a) above, will be installed in the forward section of the capstan machinery compartment. The humidistat will be secured against movement. The cable will run from the humidistat through the hatch blank to the dehumidification machine. A sensing element, similar to those specified in (a), above will be secured in the compartment. The sensing element contact will be mounted in the side of the return duct. Ductwork will be run from the capstan machinery compartment hatch to the windlass cover. The dry air will be introduced at the forward end of the cover, and the moist air will be withdrawn from the aft end. The moist-air return duct will run from the windlass cover back to the dehumidification machine. A sensing element, similar to that installed in the duct between the galley casing and the capstan machinery space hatch, will be installed in the windlass cover near the moist-air return fitting.

(c) Dehumidification System No. 3. Two dehumidification machines, similar to that specified in (a) above, will be installed, generally, as shown on figure 45. The machine will be mounted on a stand and protected with a cover fabricated, generally, in accordance with figure 46. The blank covering the machinery house doorways will be provided with holes to introduce the dry-air ducts, the moist-air return ducts, a sensing element contact, and the humidistat cables. Flexible hoses similar to that specified in (a) above, will be connected to the moist-air return fittings on the inside of the blanked door. One hose will extend to within approximately 3 feet of the after bulkhead starboard side of the machinery house and no more than 18 inches from the floor plates. The other will extend to within approximately 3 feet of the crane cab and no more than 18 inches from the floor plates. Two humidistats, similar to that specified in (a) above, will be installed in the machinery house. One will be located in the aft starboard corner of the machinery house and will be secured approximately 3 feet above the floor plates. It will be connected to the dehumidification machine servicing the aft end of the machinery house. The other humidistat will be located in the crane cab approximately 3 feet above the floor plates and will be connected to the dehumidification machine servicing the forward section of the machinery house. Two sensing elements, similar to those specified in (a) above, will be installed in the machinery house. One will be secured as far forward as the cable permits and the other as far toward the aft section as the cable permits. The element contacts will be mounted in the blank covering the doorway.

(d) Dehumidification system No. 4. A dehumidification machine, similar to that specified in (a) above, will be installed, generally, as shown on figure 45. The mchine will be mounted on a stand and protected with a cover fabricated, generally, as shown on figure 46. The hatch cover to the stern capstan machinery compartment will be secured in open position, and a blank, similar to that specified in *(b)* above, will be installed over the

hatch opening. The blank will be provided with holes for the introduction of air ducts, a sensing element, and a humidistat cable. A flexible hose, similar to that specified in (a) above, will be secured to the moist-air duct inside the hatch blank. The hose will extend to the aft section of the compartment and will terminate approximately 3 feet from the stern bulkhead in the compartment and no more than 18 inches from the floor plate. A humidistat similar to that specified in *(a)* above, will be installed approximately 3 feet from the intake end of the flexible hose and approximately 3 feet above the floor plates. A sensing element, similar to that specified in *(a)* above, will be installed. The element will be secured adjacent to the electric wiring cabinet in the compartment, and the contact will be mounted in the hatch blank.

(e) Duct connections. Connections of air ducts to the dehumidification machine will be made by unions or slip joint connections, which permit easy removal of the machine for servicing.

(f) Ductwork supports. Ductwork run on deck will be supported on wood or metal stanchions. The ducts will be secured to the stanchions by metal strapping.

(g) Humidistat installation. Humidistats will be mounted so that they are protected against movement or damage. Rubber-covered electrical cable 3 with suitable terminal connectors, will be installed to connect the humidistats to the dehumidification machines and to power lines. The manufacturer's instructions will be followed in making electrical connections. Provision will be made to prevent movement of the cables at the points where they leave the dehumidified zones.

(h) Sensing element installation. Sensing elements will extend into the dehumidified zones as far as is feasible. They will be secured against movement and against contact with metal or other conducting surfaces.

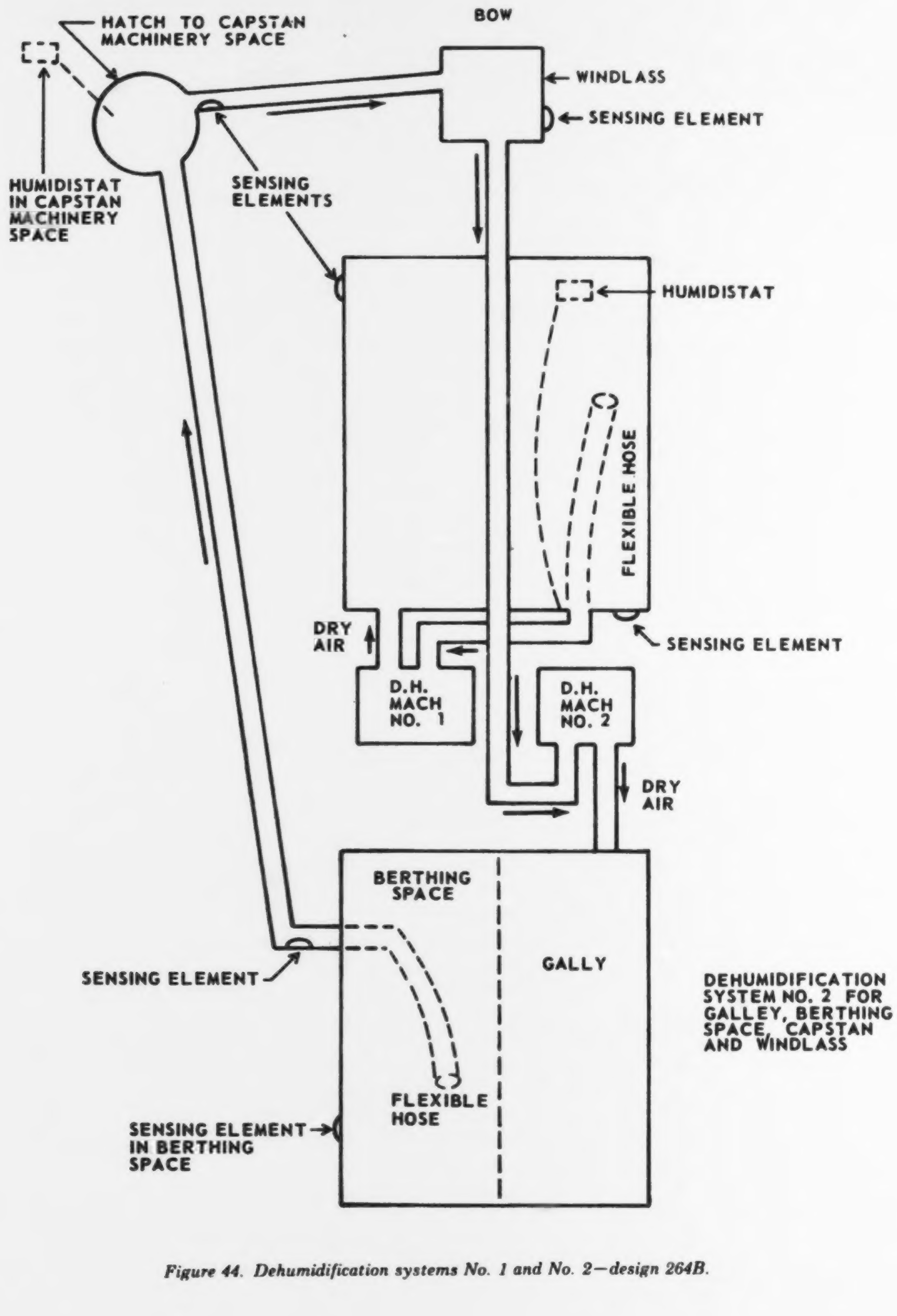

BOW
HATCH TO CAPSTAN MACHINERY SPACE
WINDLASS
SENSING ELEMENT
HUMIDISTAT IN CAPSTAN MACHINERY SPACE
SENSING ELEMENTS
HUMIDISTAT
FLEXIBLE HOSE
DRY AIR
SENSING ELEMENT
D.H. MACH NO. 1
D.H. MACH NO. 2
DRY AIR
BERTHING SPACE
GALLY
SENSING ELEMENT
DEHUMIDIFICATION SYSTEM NO. 2 FOR GALLEY, BERTHING SPACE, CAPSTAN AND WINDLASS
FLEXIBLE HOSE
SENSING ELEMENT IN BERTHING SPACE

Figure 44. Dehumidification systems No. 1 and No. 2—design 264B.

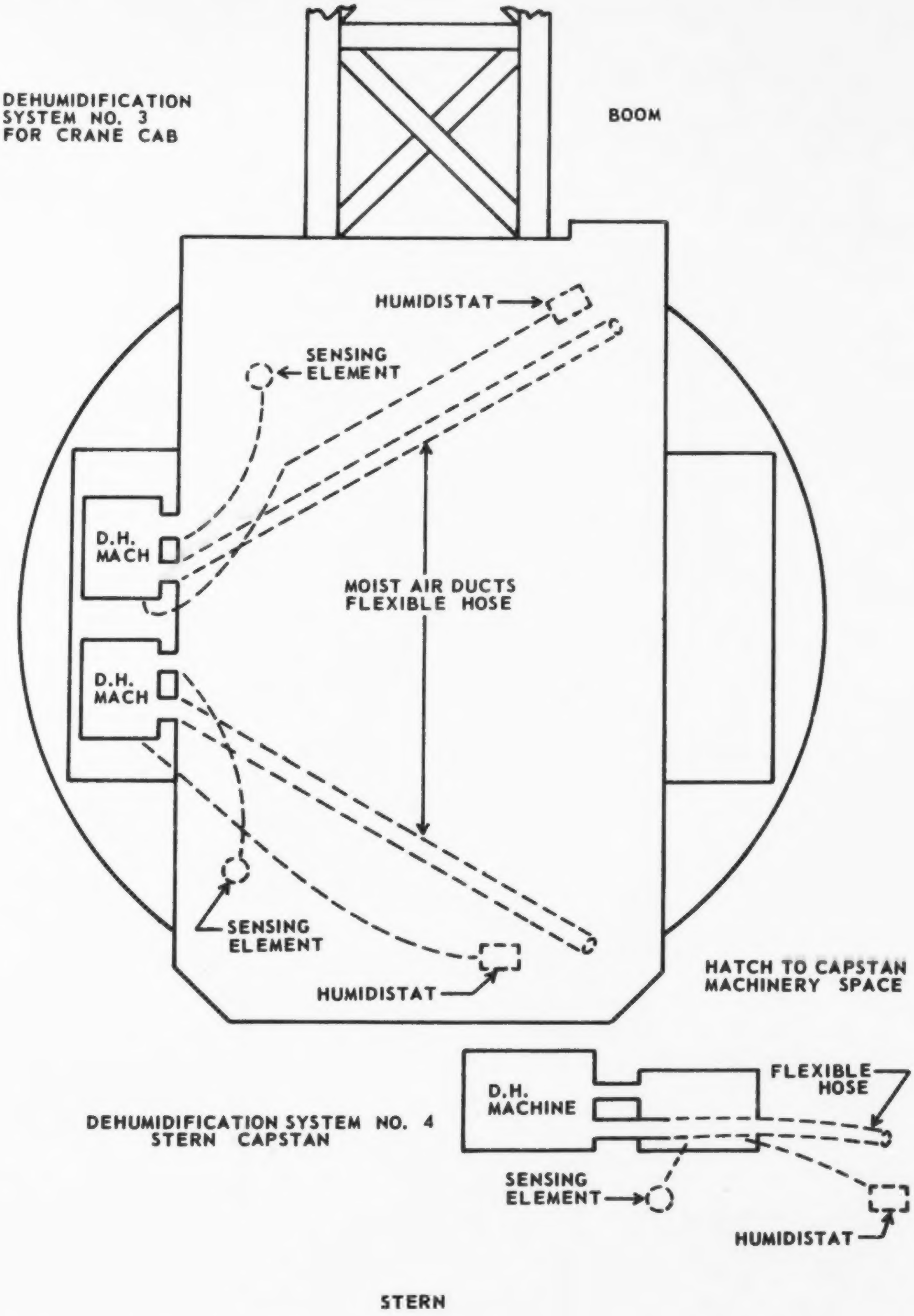
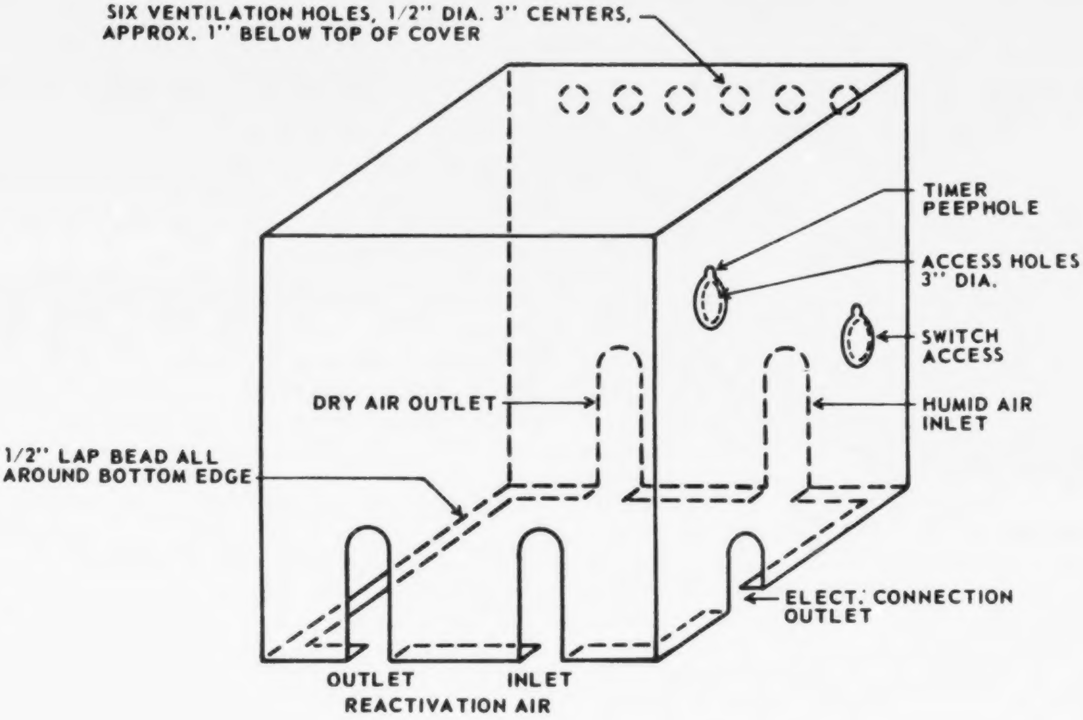
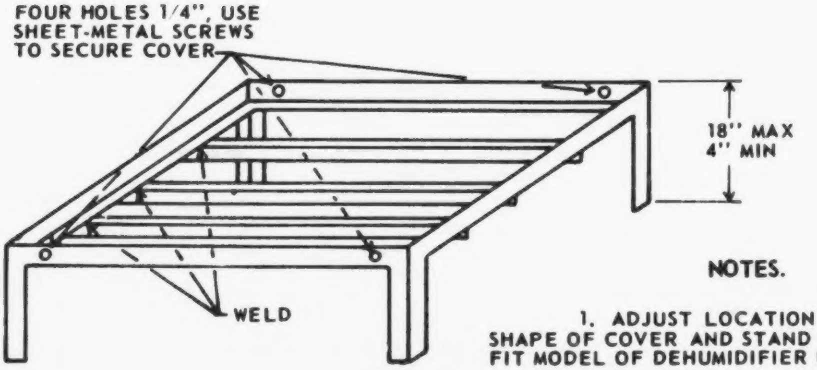

DEHUMIDIFICATION SYSTEM NO. 3 FOR CRANE CAB
BOOM
HUMIDISTAT
SENSING ELEMENT
D.H. MACH
MOIST AIR DUCTS FLEXIBLE HOSE
D.H. MACH
SENSING ELEMENT
HUMIDISTAT
HATCH TO CAPSTAN MACHINERY SPACE
D.H. MACHINE
FLEXIBLE HOSE
DEHUMIDIFICATION SYSTEM NO. 4 STERN CAPSTAN
SENSING ELEMENT
HUMIDISTAT
STERN

Figure 45. Dehumidification systems No. 3 and No. 4—design 264B.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 46. Typical cover and stand for dehumidifier.

APPENDIX N
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR CRANE, FLOATING, REVOLVING, DIESEL-ELECTRIC, 60-TON DESIGNS 413 AND 413D

---

1. General. This appendix provides detailed instructions for preparation of the floating cranes, designs 413 and 413D, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Engineroom.* The following ittems will be removed, identified, and stowed in the engineroom:

(a) Fire pump hose.

(b) Winch control and fire pump inspection covers.

(c) Ship's bell.

(d) Navigation lights.

(e) Slewing alarm.

(f) Horn, air operated.

(g) Floodlights.

(h) Boom limit switches.

(i) Anchor davit accessories.

(j) Windshield wipers.

(2) *Anchor.* The anchor will be detached from the cable and secured in the stowage fitting provided on deck.

(3) *Anchor davits.* The anchor davits will be removed from operating locations and secured on deck.

(4) *Boom.* The boom will be secured in the boom rest. The main hoist and auxiliary hoist blocks will be secured on deck.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The crane machinery house and the forward and aft winches will be prepared for dynamic dehumidification.

(2) *Provision for air circulation and moisture diffusion.* To permit maximum circulation of air within the dehumidified area, all interior doors, including cabinet doors, panel doors, switchboard doors, controller doors, and doors on similar items will be secured in open position. Manhole covers, handhole covers, and inspection plates on equipment located in the dehumidified area will be removed and secured in other than operating position.

(3) *Sealing for dehumidification.* Materials and methods used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) Control cab. The windows and door in the control cab will be covered with metal or exterior grade plywood blanks. The edges of the blanks and the vent on top of the control cable will be sealed with strippable coating and bituminous coating.

(b) Machinery house. The windows in the machinery house will be blanked with metal or exterior grade plywood. The door on the port side of the machinery house will be secured in an open position, and the resulting opening will be covered with a metal or exterior grade plywood blank. The edges of the blanks will be sealed with strippable coating and bituminous coating. The vent and exhaust stacks and hoisting cable opening on top of the machinery house will be sealed with strippable coating and bituminous coating.

(c) Winch covers. Cover will be fabricated and installed over the forward and after winches. The covers will be fabricated from minimum No. 18 gage galvanized sheet metal. All top and vertical edges will be reinforced by 1- x 1- x 1/8-inch-angle iron. The cover for the forward winch will inclose the winch motor, magnetic brake, winch controller, the ballast, and bilge pump. The fire pump will be removed from its original location and secured to the deck in the void space between the windlass and controller. This will decrease the size of the forward winch cover by five feet. The cover for the after winch will inclose the winch motor, magnetic brake and the winch controller. Coamings of 1-x 1-x 1/8- inch-angle iron will be tack welded to the deck to secure the covers. The angle irons will be positioned with one face against the deck and the vertical face toward the winch. The covers will fit snugly over the vertical faces of the coaming and will be secured to the coaming with No. 12 sheet

metal screws, spaced approximately 2 feet apart. The forward winch cover will be provided with two holes to introduce the dehumidified air ducts: One hole for the humidistat cable; and another to mount a sensing element. The after winch cover will have two holes for the dehumidified air ducts and one for a sensing element. Apertures between the coaming and the deck and all other joints and seams will be sealed with strippable coating and bituminous coating.

(d) Sealing of dehumidification piping system. The connecting points of all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All joints and seams will be similarly sealed.

(4) *Dehumidification installation.*

(a) Dehumidification system No. 1. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current, will be installed, generally, as shown on figure 47. The machine will be mounted on a stand and protected with a cover, fabricated in accordance with figure 49. An extension, terminating in a 90° elbow, will be fitted to the reactivation air outlet on the dehumidification machine in order to extend the outlet beyond the exterior side of the sheet metal cover. The elbow will be turned away from the reactivation air inlet side and turned downward 45° to prevent the direct entry of water. Four-inch-diameter, No. 26 gage, galvanized sheet metal ducts, with necessary fittings and connections, will be installed, generally, as shown on figure 47. The blank in the port side machinery house doorway will be provided with four holes: Two for the entrance of the air ducts; one for the mounting of a sensing element contact; and the fourth for the passage of the humidistat cable. A flexible hose, conforming to MIL-Spec H-8796, will be run from the moist air return fitting in the doorway blank and will terminate approximately 3 feet from the after starboard side bulkhead of the machinery house and no more than 18 inches from the deckplates. A humidistat, electronic-type, will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified area. The humidistat will be installed approximately 3 feet above the floorplate and approximately 3 feet from the intake end of the flexible hose. The humidistat will be mounted so that it is protected against movement or damage. A humidity sensing element, with 6-foot cable, will be installed in the machinery house. The element will be secured on the port side as far aft as the cable permits and the contact will be installed in the hole provided in the doorway blank. The sensing element will be secured against movement and against contact with metal or other conducting surfaces.

(b) Dehumidification system No. 2. A package dehumidifier, similar to and similarly mounted as specified for system No. 1, will be installed, generally, as shown on figure 48. Ductwork, similar in size to that specified for system No. 1, will be installed, generally, as shown on figure 48. The dry-air connection from the machine will enter the starboard side of the aft winch cover. Ductwork will carry the air from the portside of the aft cover to the port side of the forward winch cover. The return air will then be withdrawn from the starboard side of the forward cover and carried back to the moist air connection on the dehumidification machine. A humidistat, similar to that specified for system No. 1, will be installed in the forward winch cover. The humidistat will be secured near the winch motor. A humidity sensing element, without cable, will be installed in the forward winch cover.

(c) Duct connections. Connections of air ducts to the dehumidification machines will be made by unions or slip joint connections, which permit easy removal of the machines for servicing.

(d) Ductwork supports. Ductwork run on deck will be supported on wood or metal stanchions. The ducts will be secured to the stanchions by strapping.

(e) Humidistat connections. Rubber covered electrical cable, with suitable terminal connections, will be installed to connect the humidistats to the dehumidification machine. The manufacturer's instructions will be followed in making electrical connections. Provisions will be made to prevent movement of the cables at the points where they leave the dehumidified areas.

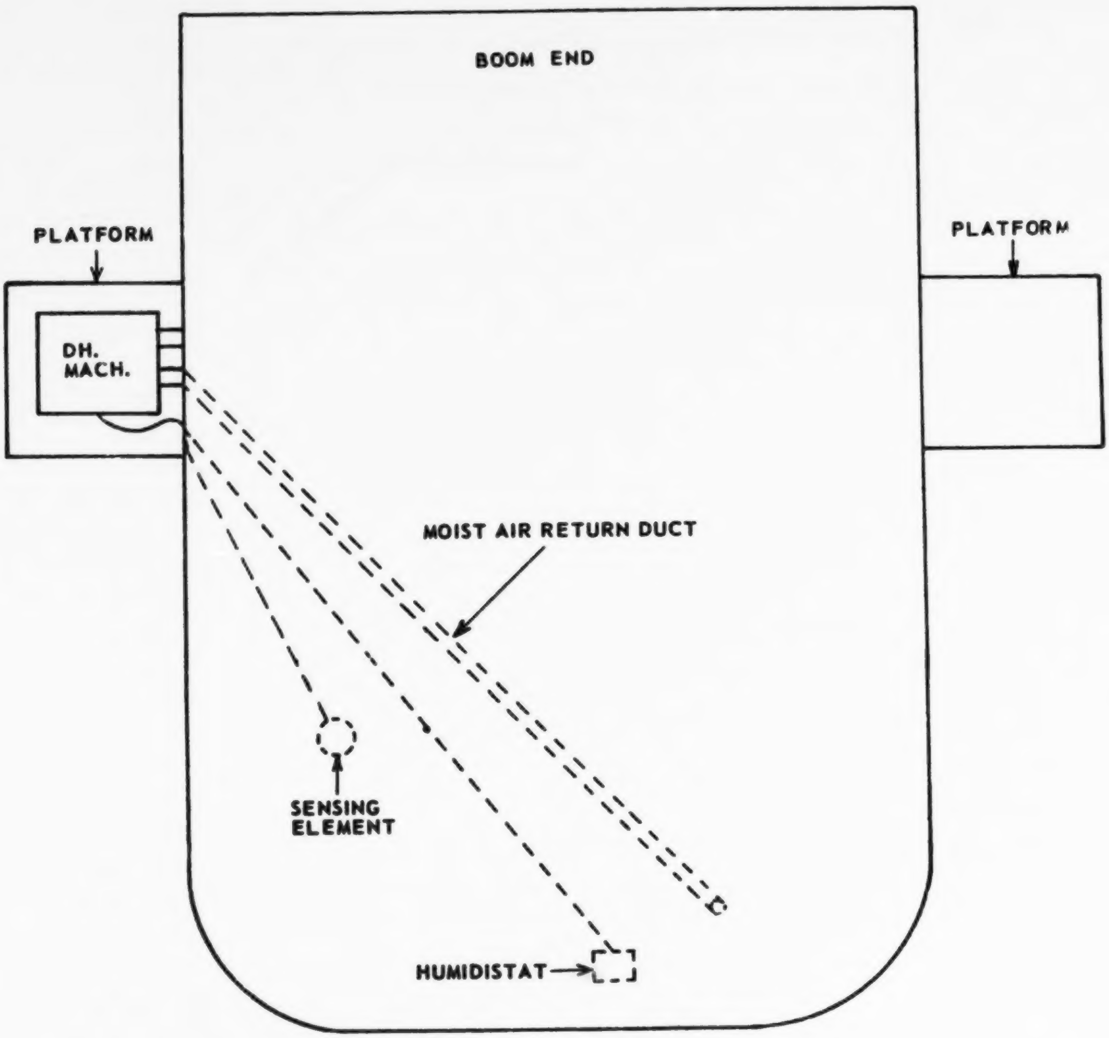


Figure 47. Dehumidification system No. 1.

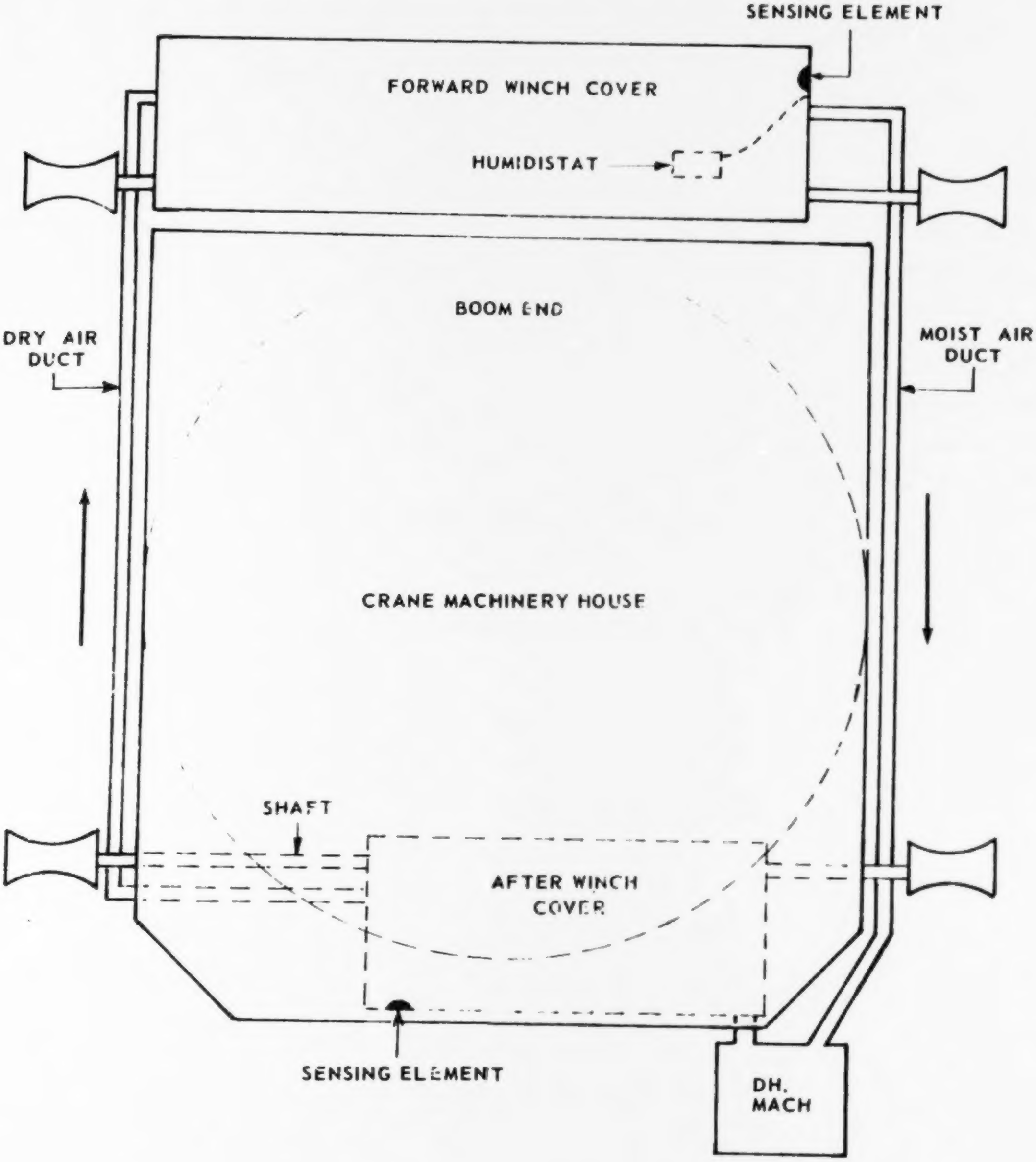
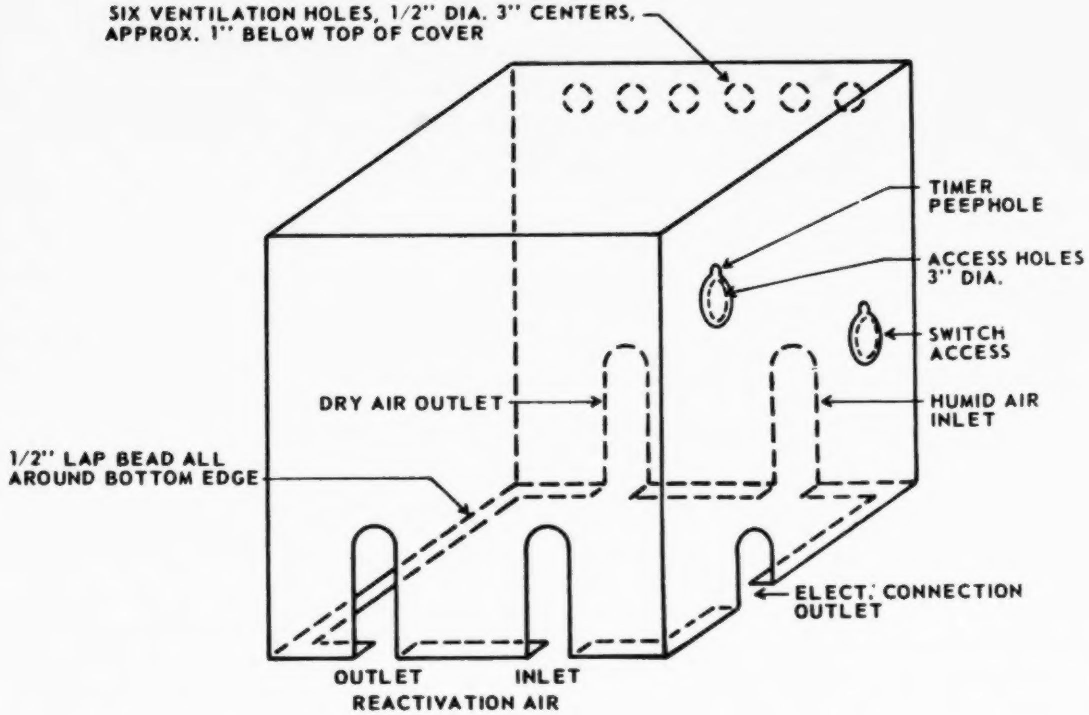
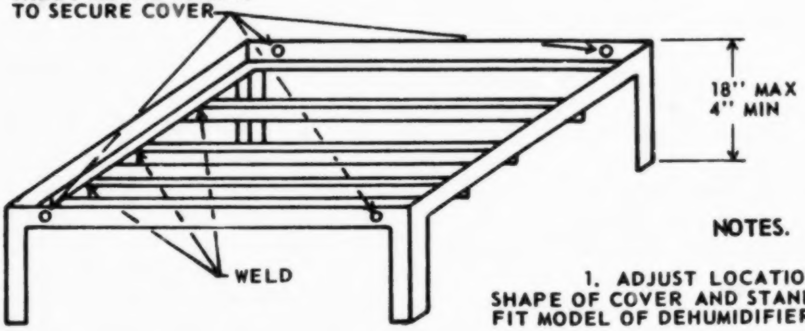


Figure 48. Dehumidification system No. 2.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 49. Typical cover and stand for dehumidifier.

APPENDIX O
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR BARGE, REFRIGERATED CARGO, NONPROPELLED, STEEL, 14,200 CUBIC FOOT CAPACITY, 120-FOOT, DESIGN 7010

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1. General. This appendix provides detailed instructions for preparation of the refrigerated cargo barge, design 7010, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Engineroom.* The following items will be removed, identified, and stowed in the engineroom:

(a) Rope, blocks, and tackle (anchor davit).
(b) Navigation lights and stanchions.
(c) Fire hose.
(d) Toggle pins and chains.
(e) Portable water hose.
(f) Bell.
(g) Canvas covers.
(h) Fire line discharge valve bonnets.
(i) Engineroom hatch cover.

(2) *Starboard storage compartment.* The following items will be removed, identified, and stowed in the starboard storage compartment.

(a) Anchor davit.
(b) Anchor cable stopper.
(c) Rake and access hatch covers.

(3) *Anchors.* The anchors will be detached from the anchor cables and stowed on deck. They will be secured by use of existing anchor stowage fittings.

(4) *Dehydrators.* All dehydrating elements (line dryers) will be removed and discarded. Cover plates will be replaced over the dryer container, and each system involved will be purged of air.

(5) *Exhaust system.* The flexible section will be removed from each exhaust system and secured adjacent to its place of use. The clean-out plugs will be removed from the manifolds and secured adjacent to the openings. Soot cans will be cleaned and secured to the air silencer.

(6) *Hydraulic governors.* The housing cover will be removed and secured to the governors in other than operation position.

(7) *Anchor davit socket.* The anchor davit socket opening will be coated with type P-2 preservative and sealed against the entry of water, using caps, plugs or tape and strippable compound.

b. Preparation for dynamic dehumidification.

(1) *Dehumidification area.* The two enginerooms and stack and the four refrigerated compartments and vestibules will be prepared for dynamic dehumidification.

(2) *Provisions for air circulation and moisture diffusion.* To permit circulation of air within the dehumidified zones, all doors within the enginerooms, including panel doors, cabinet doors, and doors of similar items, will be secured in open position. The interior refrigerator doors, including the vestibule doors within the refrigeration compartment, will be secured in an open position to permit circulation of air.

(3) *Sealing for dehumidification.* Materials and methods used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) Engineroom access hatches. The opening, resulting from the removal of either the port or starboard engineroom access hatch cover, will be blanked with galvanized sheet metal or ½-inch exterior grade plywood blank provided with holes, of sufficient size for introducing dehumidification ductwork sensing elements and humidistat cable. The removed engineroom access hatch cover will be stowed in the engineroom. The blank and the remaining engineroom access hatch cover will be sealed at the edges with strippable coating and bituminous coating troweled into the aperture between the coaming and the closed cover and blank.

(b) Refrigerator compartments. Each cargo hatch cover will be raised to a sufficient height, to permit introducing dehumidification ductwork. Each hatch cover will be supported by three rows of 4-x4-inch timbers placed across the short dimen-

sion of the hatch opening. The timbers will be spaced at approximately equal intervals over the hatch opening. The ends of the timbers will extend approximately 6 inches beyond the hatch coaming and will be notched to a depth of ½ inch, plus or minus 1/8 inch, at lines of intersection with the coaming. The four sides of the cargo hatches will be blanked with exterior grade plywood or galvanized sheet metal. The blanks will be sealed with strippable coating and bituminous coating. The strippable coating and bituminous coating will extend to assure watertight seal between blanks, the hatch tops and lower coamings, and around the protruding ends of the 4-x4-inch timbers.

(c) Stack. The covers under the stack hood will be secured in closed position and sealed with strippable coating and bituminous coating.

(d) Exhaust lines and vent lines. The engine exhaust lines and the vent line located in the stack will be closed with caps, plugs, blanks or pressure-sensitive tape, and sealed with strippable coating and bituminous coating.

(e) Vents, fills, and overflow lines. All vent, fill, and overflow lines opening into the dehumidified area will be closed with caps, plugs, blank or pressure-sensitive tape, and sealed with strippable coating and bituminous coating.

(f) Doors, hatches and manholes. All exterior doors, hatches, manholes leading into a dehumidified zone, except those used for introduction of dehumidification piping, and the one exterior door used for inspection purposes, will be closed and sealed with tape. The exterior port or starboard door used for monthly inspection of refrigerator compartments will be left unsealed and marked accordingly. Where hatch or manhole cover fits over a raised coaming, bituminous coating will be troweled into the aperture between the closed cover and the coaming. Flush-type doors and covers will be sealed with strippable coating and bituminous coating. Recessess in covers for opening devices will be masked with pressure-sensitive tape and coated with strippable coating.

(g) Dehumidification piping system. The connecting points to all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All joints will be similarly sealed.

(4) *Dehumidification installation.*

(a) Dehumidification systems, zone 1. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current, will be installed, generally, as shown in figure 51. The machine will be mounted on a stand and protected with a cover, fabricated in accordance with figure 52. One machine will service the port and starboard engineroom and stack. The machine will be installed on the barge deck adjacent to the port or starboard engine access hatch, as shown in figure 51. An extension, terminating in a 90° elbow, will be fitted to the reactivation air outlet on the dehumidification machine in order to extend the outlet beyond the exterior side of the sheet metal cover. The elbow will be turned away from the reactivation air inlet side and turned downward 45° to prevent the direct entry of water.

1. Duct installation No. 1. One engineroom access hatch cover shall be removed and stowed in the engineroom. A galvanized sheet metal or ½-inch exterior grade plywood blank will be installed over the hatch opening. The blank will be sealed with strippable coating and bituminous coating. Holes of sufficient size will be provided to introduce the air ducts, humidistat cable, and sensing elements. The air from the dehumidification machine will enter one side of the engineroom bulkhead and will be removed from the opposite side. Connect one length of flexible 4-inch hose, conforming to MIL-H-8796, to the moist-air return connection at the machine to remove the moist air from the lower extremities of the engineroom.

2. Air duct installation and machine connections. Four-inch, No. 26 gage, galvanized tubing, with necessary cells, tees, reducing fittings, supports, and connections, will be installed. Ducts will run with a minimum of bends, as shown in figure 51. Connections of the duct to the dehumidification machine will be made with unions or slip joint connections, which permit easy removal of the machine for servicing.

3. Humidistat. A hair-type humidistat is set to maintain a 40-percent relative, humidity, plus or minus 5 percent, within the enginerooms and may be installed in either the port or starboard engineroom. The humidistat will be located approximately 3 feet above the floor plate and secured to the centerline bulkhead. The humidistat will be connected to the dehumidification machine by a No. 18, two-conductor, rubber covered cable with suitable connectors.

4. Sensing elements. Two sensing elements with cable will be installed, one in each engineroom, as shown in figure 51.

(b) Dehumidification system, zone 2. Four package dehumidifiers, single desiccant bed, ab-

sorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current, will be installed, generally, as shown in figure 53. The machines will be mounted on stands and protected with covers fabricated in accordance with figure 52. Each machine will dehumidify one refrigerated compartment. The machines will be installed on the top of the refrigerated barge adjacent to the cargo loading hatch. An extension, terminating in a 90° elbow, will be fitted to the reactivation air inlet on each dehumidification machine in order to extend the outlet beyond the exterior side of the sheet metal cover. The elbow will be turned away from the reactivation inlet side and turned downward 45° to prevent direct entry of water.

1. Duct installation No. 2. The cargo loading hatches atop the reefer barges will be raised, as specified, and the four sides blanked with galvanized sheet metal or ½-inch, exterior-type, grade A/C plywood. The blanks will be sealed with strippable coating and bituminous coating. Suitable penetrations large enough to permit the introduction of air ducts, humidistat cable, and the mounting of sensing elements will be provided. The air from the dehumidification machines will enter from the center cargo loading hatch, and the moist air will be removed from the farthest-lowest point of the refrigerated compartment. A length of flexible 4-inch hose, conforming to MIL-H-8796, will be connected to the moist-air return line to remove the moist air from the lower extremities of the refrigerated compartments.

2. Air duct installation and machine connections. Four-inch, No. 26 gage, galvanized tubing, with necessary ells, tees, reducing fittings, supports, and connections, will be installed. Ducts will run with a minimum of bends, as shown in figure 53. Connections of the duct to the dehumidification machine will be made with unions or slip joints connections, which permit easy removal of the machine for servicing.

3. Humidistats. A hair-type humidistat with a control setting of 52½-percent relative humidity, plus or minus 2½ percent, will be installed in each refrigerated compartment of the barge from which the moist air return duct goes directly to the dehumidification machine. The humidistats will be connected to the dehumidification machine with No. 18 two-conductor, rubber covered cable with suitable terminal connectors. The humidistats will be installed at a height of approximately 3 feet above the deck and at a distance of approximately 3 feet from the intake end of the moist air return ducts. Instruments will be mounted, so that they are protected against movement or damage.

4. Sensing elements. Two sensing elements, with cable, will be installed, two to each refrigerated compartment: one fore, one aft, as shown in figure 53.

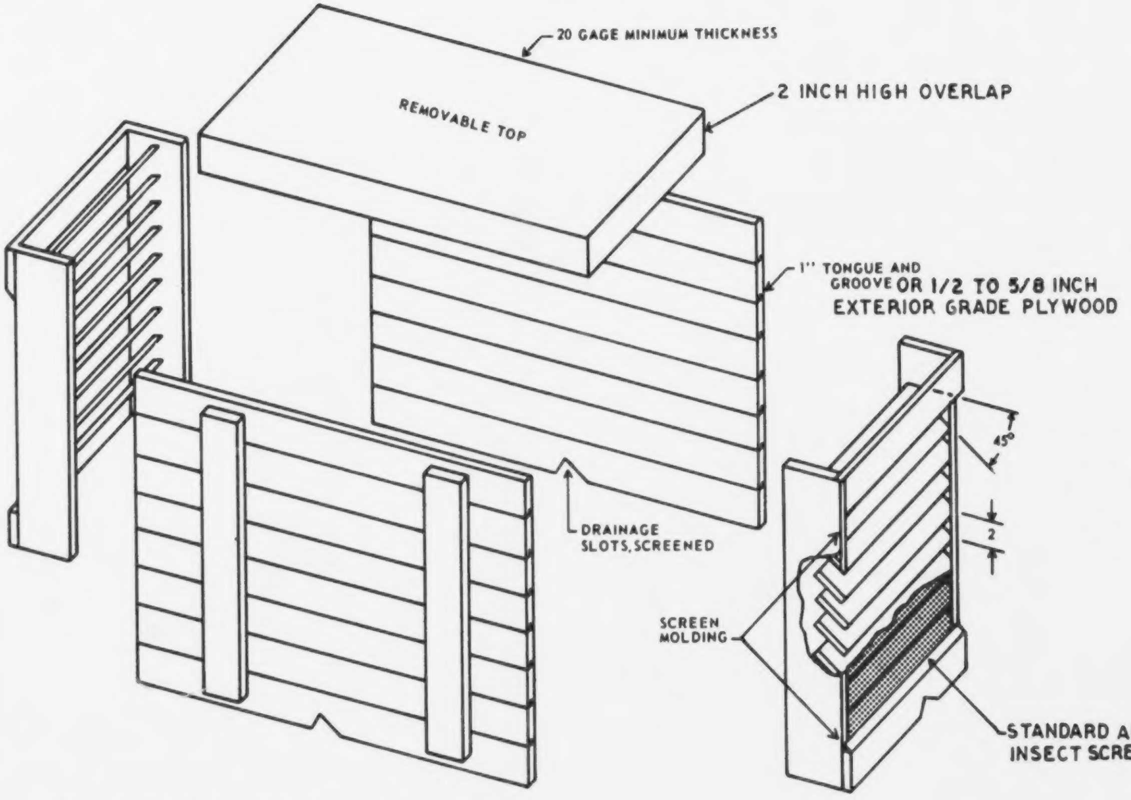
c. Ventilation of spaces not under dehumidification. Provisions will be made for ventilation of the following spaces not under dehumidication:

(1) *Anchor windlass cover.* A ventilated, demountable cover will be installed over the windlass. The sides and ends will be pained as specified and fabricated, generally, as shown in figure 50. To facilitate disassembly, the sides and ends will be fastened to each other with galvanized hooks and eyes. A minimum of two fasteners will be used at each junction of a side and end. A roof, fabricated from minimum No. 20 gage galvanized sheet metal, will be fitted over the sides and ends and will overlap approximately 2 inches. Two lengths of minimum No. 12 gage, black, annealed wire, positioned approximately one-third the length of the cover from each end, will be used to secure the roof in place. The wire will run across the roof and will be secured to screw eyes located in the sides of the cover. The cover will be secured by wiring to convenient points.

(2) *Screening of ventilation openings.* Louvered faces of covers, fabricated to provide ventilation, and openings on gooseneck-and mushroom-type vents, will be covered with standard aluminum insect screening.

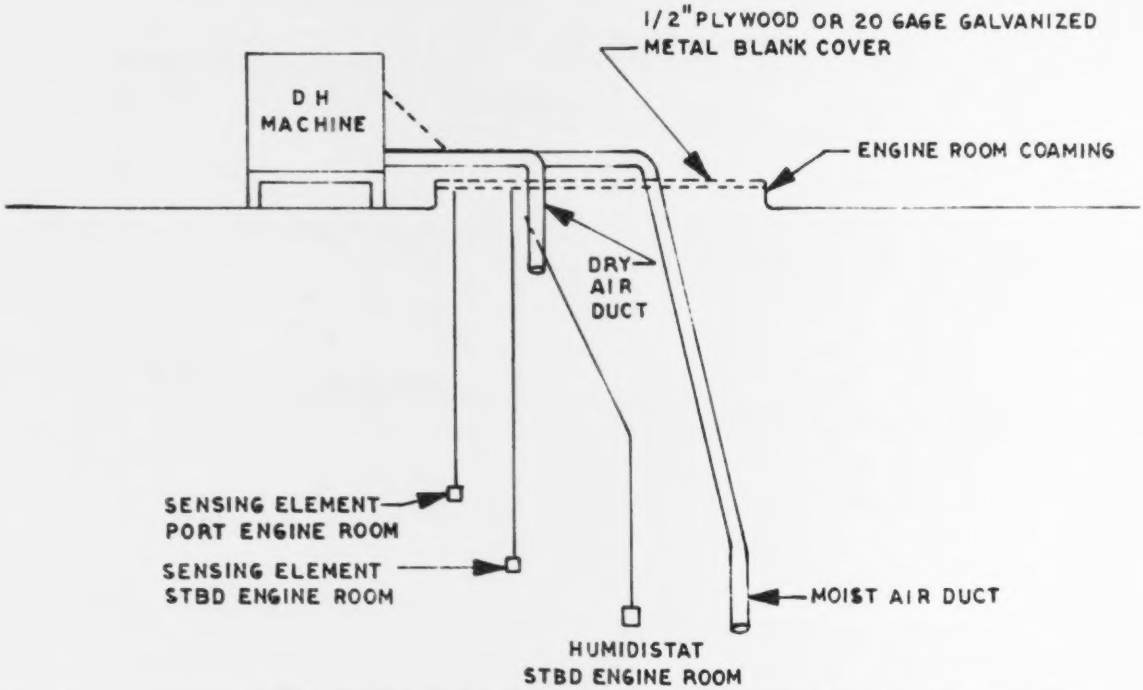
(3) *Forward and aft rake ends.* The openings, resulting from removal of the access hatch covers to the rake ends will be fitted with blanks fabricated from exterior grade plywood or minimum No. 20 gage galvanized sheet metal. The blanks will be secured over the opening and will be provided with minimum, 6-inch, gooseneck-type, galvanized vents.

(4) *Storage Compartments.* The access hatches to the four hold storage compartments shall be secured in partially open position and a ventilated cover, painted as specified, and fabricated, generally, as shown in figure 50, will be fitted over the hatches and secured by wiring to convenient fittings. The gooseneck vents will be secured in the open position. The manhole covers and drain plugs on the tanks located in the storage compartments will be removed and secured adjacent to their places of use. The tank vents will be secured in open position.


20 GAGE MINIMUM THICKNESS
2 INCH HIGH OVERLAP
REMOVABLE TOP
1" TONGUE AND GROOVE OR 1/2 TO 5/8 INCH EXTERIOR GRADE PLYWOOD
45°
2
DRAINAGE SLOTS, SCREENED
SCREEN MOLDING
STANDARD ALUM. INSECT SCREEN

ALL TONGUE AND GROOVE LUMBER TO BE 1" NOMINAL
ALL EXTERIOR GRADE PLYWOOD TO BE 1/2 TO 5/8 INCH NOMINAL
NOTE: ALL WOODEN SURFACES TO BE PAINT AS SPECIFIED HEREIN

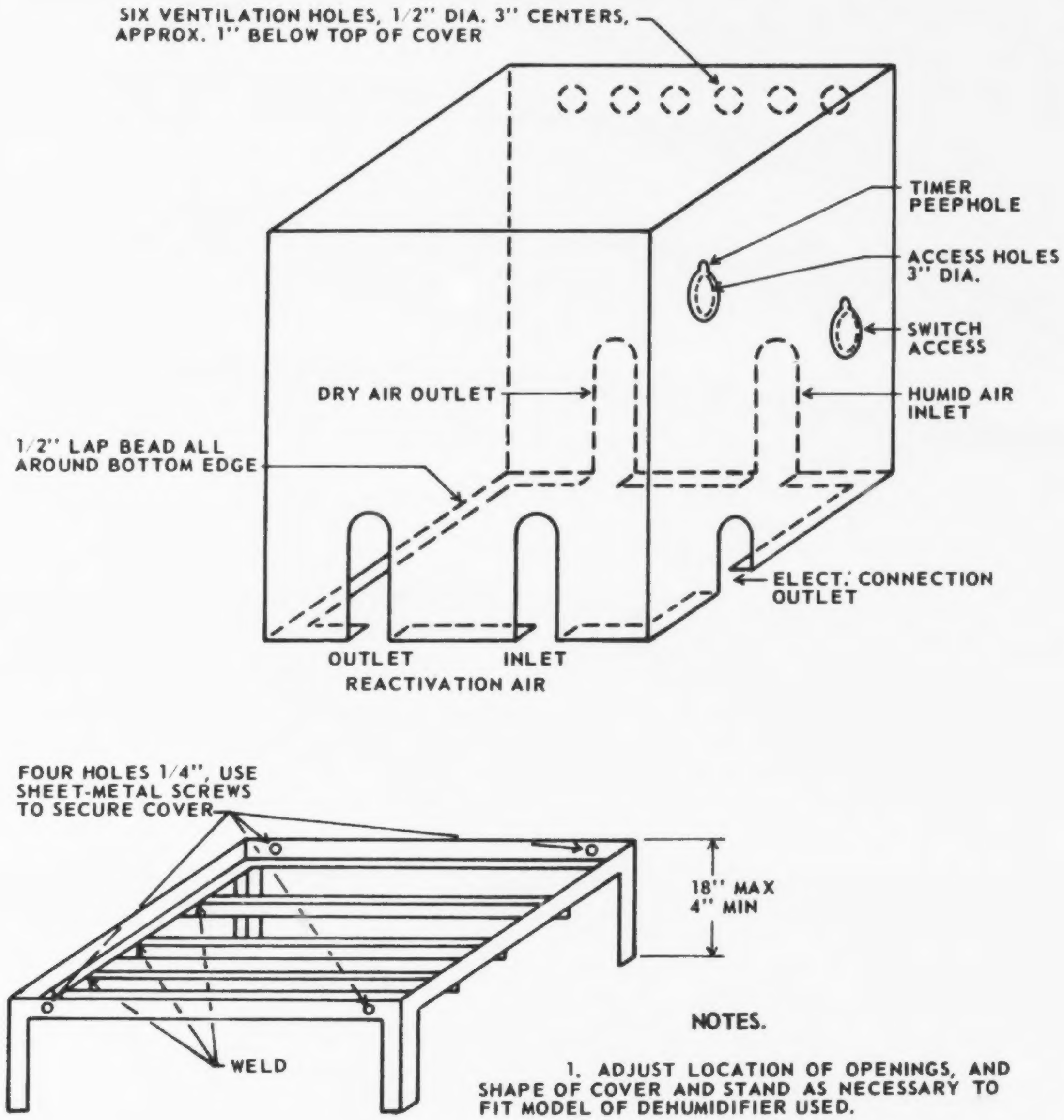
Figure 50. Ventilated cover.


1/2" PLYWOOD OR 20 GAGE GALVANIZED METAL BLANK COVER
D H MACHINE
ENGINE ROOM COAMING
DRY AIR DUCT
SENSING ELEMENT PORT ENGINE ROOM
SENSING ELEMENT STBD ENGINE ROOM
MOIST AIR DUCT
HUMIDISTAT STBD ENGINE ROOM

NOTE: 1. Remove port engine hatch cover and stow in Engine Room.

2. If STBD Engine Room hatch is used the moist air return duct and one sensing element with humidistat will be located in Port Engine Room.

Figure 51. Dehumidification system for port engine room.


SIX VENTILATION HOLES, 1/2" DIA. 3" CENTERS, APPROX. 1" BELOW TOP OF COVER
TIMER PEEPHOLE
ACCESS HOLES 3" DIA.
SWITCH ACCESS
DRY AIR OUTLET
HUMID AIR INLET
1/2" LAP BEAD ALL AROUND BOTTOM EDGE
ELECT. CONNECTION OUTLET
OUTLET
INLET
REACTIVATION AIR
FOUR HOLES 1/4", USE SHEET-METAL SCREWS TO SECURE COVER
18" MAX
4" MIN
WELD

NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 52. Typical cover and stand for dehumidifier.

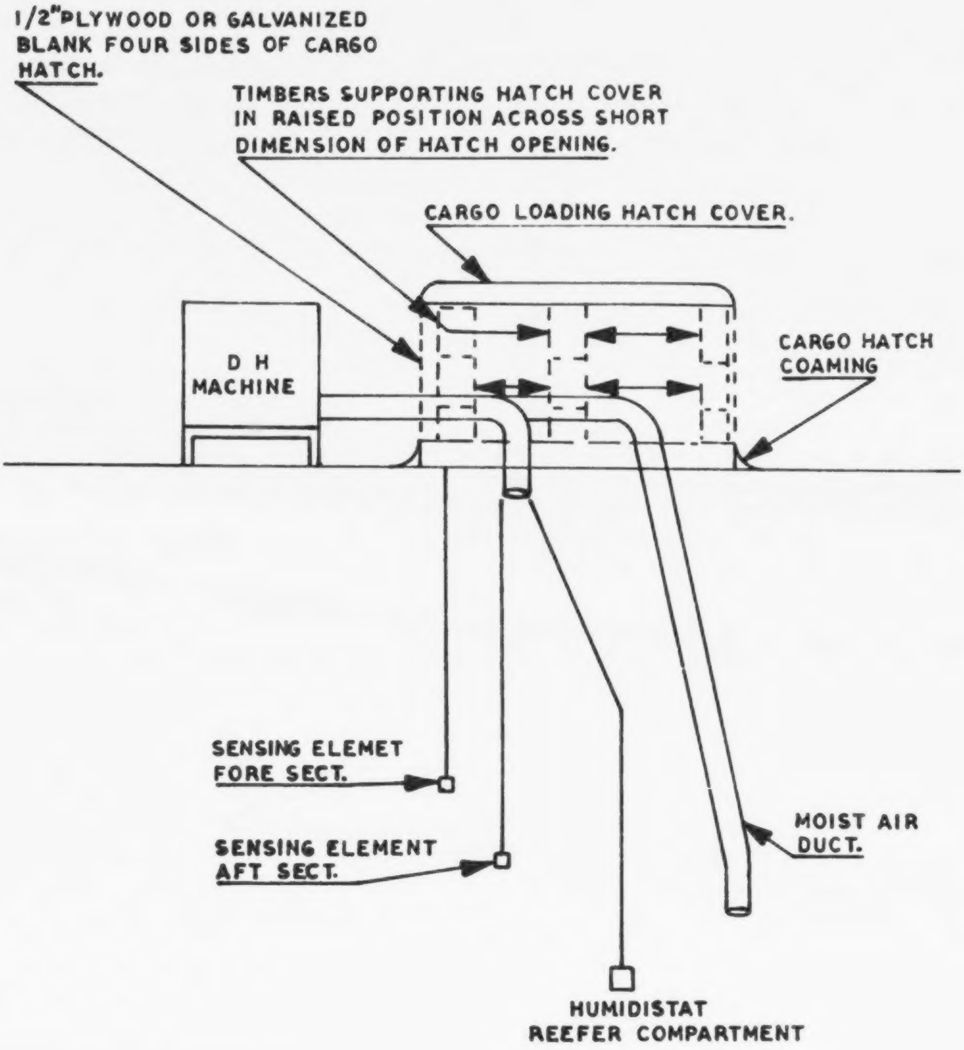

1/2" PLYWOOD OR GALVANIZED BLANK FOUR SIDES OF CARGO HATCH.
TIMBERS SUPPORTING HATCH COVER IN RAISED POSITION ACROSS SHORT DIMENSION OF HATCH OPENING.
CARGO LOADING HATCH COVER.
D H MACHINE
CARGO HATCH COAMING
SENSING ELEMET FORE SECT.
SENSING ELEMENT AFT SECT.
MOIST AIR DUCT.
HUMIDISTAT REEFER COMPARTMENT

Figure 53. Dehumidification system for refrigerated compartments.

APPENDIX P
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR REPAIR SHOP, FLOATING, MARINE REPAIR, NONPROPELLED, STEEL, 210-FOOT, DESIGN 7011

---

1. General. This appendix provides detailed instructions for preparation of the floating repair shop, design 7011, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Main deckhouse.* The following items will be removed, identified, and stowed within the main deckhouse:

(a) Motors (weather exposed).
(b) Floodlights.
(c) Searchlights.
(d) Navigation lights.
(e) Amplifiers (weather exposed only).
(f) Air whistle and bell.
(g) Lifeboat falls and gear.
(h) Lifeboats and gear.
(i) Anchor falls.
(j) Canvas covers.
(k) Halyards and staffs.
(l) Chain railing and stanchions.
(m) Dog wrenches and keys.
(n) Handles for davits, windlass brakes, and monorail topping winch.

(2) *Crane cab.* The crane windshield wiper blades will be secured to the wiper motor within the cab.

(3) *Exhaust systems.* The flexible section will be removed from each exhaust system and secured adjacent to its place of use.

(4) *Boiler.* Inspection door to firesides and inspection covers to watersides will be secured in open position. The first section of the boiler stack above the boiler will be removed and secured, against movement, within the boiler compartment.

(5) *Distiller.* To permit circulation of air within the distiller, inspection plates will be secured in open position.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The entire vessel, except the forepeak, the forward chain locker, and the midships deckhouse, will be prepared for dynamic dehumidification.

(2) *Provision for air circulation and moisture diffusion.* Within the areas being dehumidifed, all interior doors will be secured in open position. All dampers in the ventilation systems will be turned to open position. The bolted plate in the bulkhead forward of the heating boiler will be removed and secured. The hatch boards will be installed over the hatch openings in the main deck to induce longitudinal circulation of air through the vessel. Doors and hinged covers on refrigerators, galley range, ovens, boiler, and electrical panels and boxes will be secured in open position. Manhole and handhole covers, opening into tanks and the aft chain locker, will be removed and secured.

(3) *Blowers for main dehumidification system.* Two fans will be installed in the hold. One will be attached in the opening created by removal of the bolted plate from the boiler room bulkhead. The other will be placed in the doorway located in the starboard side of the watertight bulkhead at the forward end of the No. 1 hold. Both fans will be positioned to create flow of air toward the midship hold. The fans will be wired into the main dehumidification system so that they operate and shut off simultaneously with the dehumidification machine. The fans will be nominal 16-inch size, propeller-type, non-oscillating, operable on 115 volts, 60-cycle current, with explosion-proof motor, conforming to MIL-Spec F-16081. The fans will be attached to suitable brackets or plywood frames for mounting in specified locations. Guards will be installed for protection of personnel.

(4) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below.

(a) Aft chain pipe opening. The aft chain pipe opening will be covered with a blank fabricated from ½-inch exterior grade plywood or No. 26 gage galvanized sheet metal. The blank will be firmly secured over the opening and will be provided with a hole of sufficient size to permit the passage of the sensing element and the installation of the sensing

element contact. The blank will be sealed with strippable coating and bituminous coating.

(b) Dehumidification piping system. The connecting points of all air ducts to areas being dehumidifed will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All joints and seams in the ducts will be similarly sealed.

(c) Miscellaneous sealing. Edges of doors, portlights, hatches, hoods, ventilation openings having installed covers, and all other openings, in the nature of seams or joints between closely opposed surfaces, will be sealed with strippable coating and bituminous coating.

(5) *Dehumidification installation.*

(a) Main dehumidification system. A rotary, desiccant, electric dehumidifier, solid wheel type 20-153, 150,000 cubic feet capacity, 440-volt, alternating-current, 60-cycle, 3 kW, will be installed atop the main deckhouse, generally as shown on figure 54. Install an electrical system whereby the operation of the machine and the fans specified in (3) above will be controlled by the humidistat specified in *(e)* below, without overload of any component. The bottom plate will be removed from the ventilator located aft of the midship deckhouse, tagged, and stowed within the deckhouse. A steel metal flange, fabricated and fitted in accordance with figure 57, will be installed in place of the ventilator cover. Six-inch diameter, No. 26 gage, galvanized tubing will be installed between the dry air outlet and moist air return openings on the machine and the appropriate fittings on the sheet metal flange. A dry air dispenser of 6 inch diameter, No. 26 gage, galvanized tubing, fabricated in accordance with figure 57, will be attached to the flange through the opening in the machine shop overhead. The horizontal section of the dry air dispenser will face fore and aft. Nominal 6-inch-diameter flexible hose will be run from the moist air return fittings in the sheet metal flange down through the hatch to the carpentry shop, as shown on figure 54. The lower end of the hose will be no more than 18 inches above carpentry shop deck. Sensing elements will be installed in accordance with (f) below.

(b) Aft deckhouse dehumidification system. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current, will be installed, generally, as shown on figure 58. The machine will be mounted on a stand and protected with a cover, fabricated in accordance with figure 56. A portlight in the forward bulkhead of the aft deckhouse will be opened. A No. 20 gage galvanized sheet metal flange or a ½-inch plywood blank will be fitted into the portlight opening. The blank will contain two 4-inch-diameter holes with fittings for attachment of sheet metal ducts. One hole of sufficient size to receive a humidistat cable, and one hole of sufficient size to receive the sensing element assembly. Four-inch-diameter, No. 26 gage, galvanized sheet metal ducts will be installed between the dry air outlet and the moist air return opening on the dehumidification machine and the fitted opening in the flange. Within the deckhouse, the dry air duct will extend to a point approximately 3 feet from the aft bulkhead of the galley and approximately 3 feet from the aft bulkhead of the galley and approximately 6 feet above the deck. The moist air return line will extend from the flange to a point approximately 2 feet above the deck. An electronic humidistat will be installed within the deckhouse as specified in *(e)* below. A sensing element will be installed as specified in *(f)* below.

(c) Crane cab dehumidification system. A package dehumidifier, of the same type and capacity specified in *(b)*, above will be installed generally as shown on figure 55. The machine will be mounted on a stand and protected with a cover, fabricated in accordance with figure 56. The bolted portable plate on the port side front of the crane cab will be removed and replaced with a ½-inch thick exterior grade plywood or No. 20 gage galvanized sheet metal blank. The blank will contain holes and fittings for the 4-inch dry air and moist air ducts, for the humidistat cable, and for the sensing element assembly. Four-inch-diameter, No. 26 gage, galvanized sheet metal ducts will be installed from the dry air and moist air connection of the dehumidification machine to the openings in the blank. The dry air duct will extend to the after starboard corner of the cab and terminate approximately 3 feet from the bulkhead. The moist air return duct will terminate at the blank. Humidistat installation will be in accordance with *(e)* below. Sensing element will be installed as specified in *(f)* below.

(d) Duct connections. Connection of air ducts to the dehumidification machines will be made by unions or slip joint connections, which permit easy removal of the machines for servicing.

(e) Humidistat installation. Hair-type electronic humidistats will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified areas. The humidistats will be installed at a height of approximately 3 feet above deck and at a distance of approximately 3

feet from intake end of the moist air return ducts. Instruments will be mounted so that they are protected against movement or damage. Rubber covered electrical cable, with suitable terminal connectors, will be installed to connect the humidistats to the dehumidification machines and to the power lines. The manufacturer's instructions will be followed in making the electrical connections. Provisions will be made to prevent movement of the cables at the points where they leave the dehumidified zones.

(f) Sensing elements. Three humidity sensing elements, with 6 foot cables, will be installed in the main dehumidification system, one each in the control room, the fresh water tank, and the after chain locker. Two humidity sensing elements, without cable, will be installed, one each for the crane cab and the aft deckhouse. The sensing elements, with cable, will extend downward into the dehumidified area as far as the cable permits. They will be secured against movement and against contact with metal or other conducting surfaces. The sensing element contacts will be installed as follows:

1. Control room. The sensing element contact will be installed in a blank placed in the after portlight on the starboard side. The blank will be fabricated from ½-inch-thick exterior grade plywood or No. 20 gage galvanized sheet metal.

2. Fresh water tank. The sensing element contact will be mounted in a blank sealed to the top of the filling pipe.

3. Aft chain locker. The sensing element contact will be installed in the blank used to seal the aft chain pipe opening.

4. Crane cab and aft deckhouse. The sensing elements for these spaces will be mounted in the blanks provided for entrance of the dehumidification air ducts.

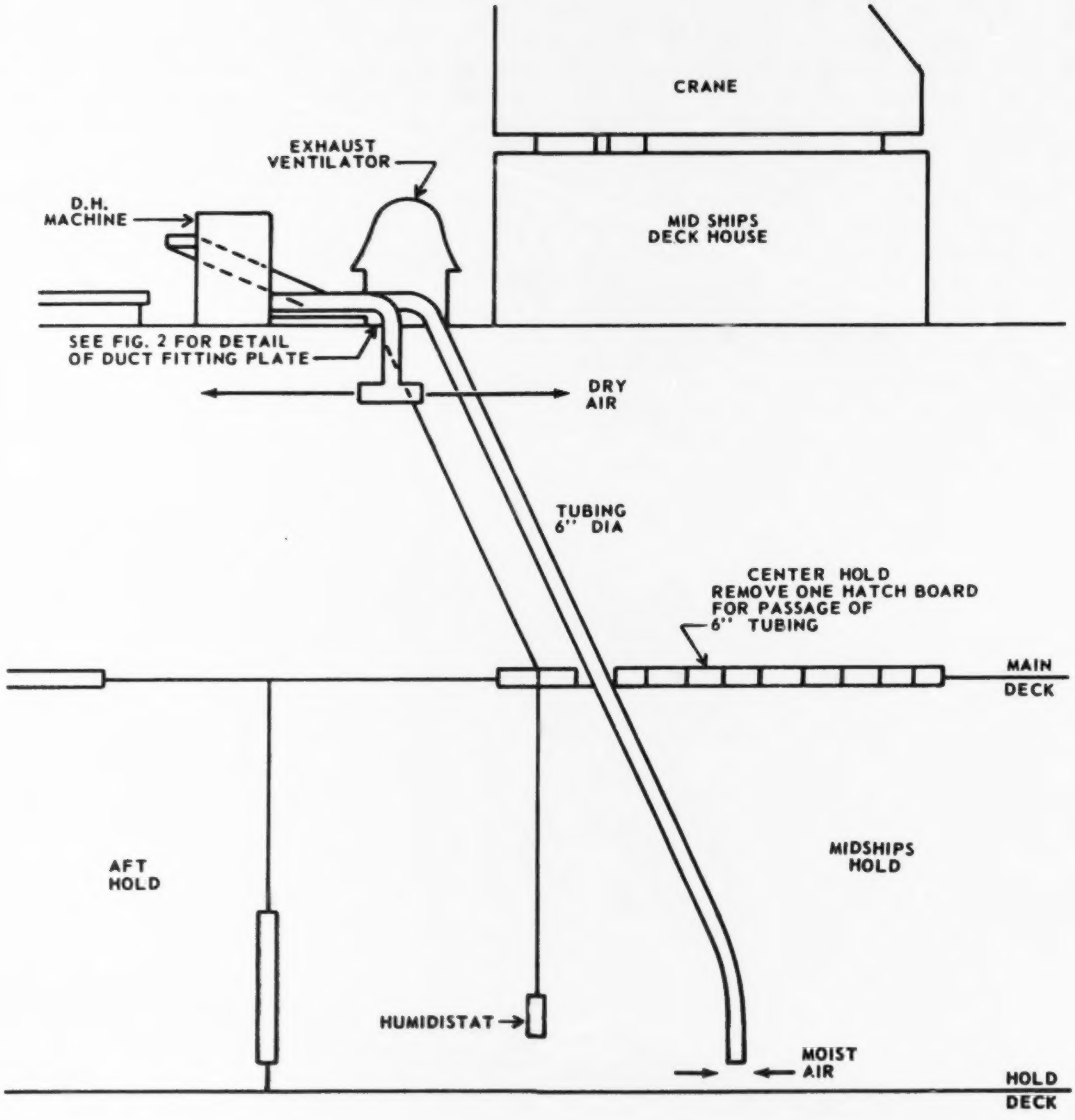


Figure 54. D. H. piping for main D. H. system, 150,000 CFM machine.

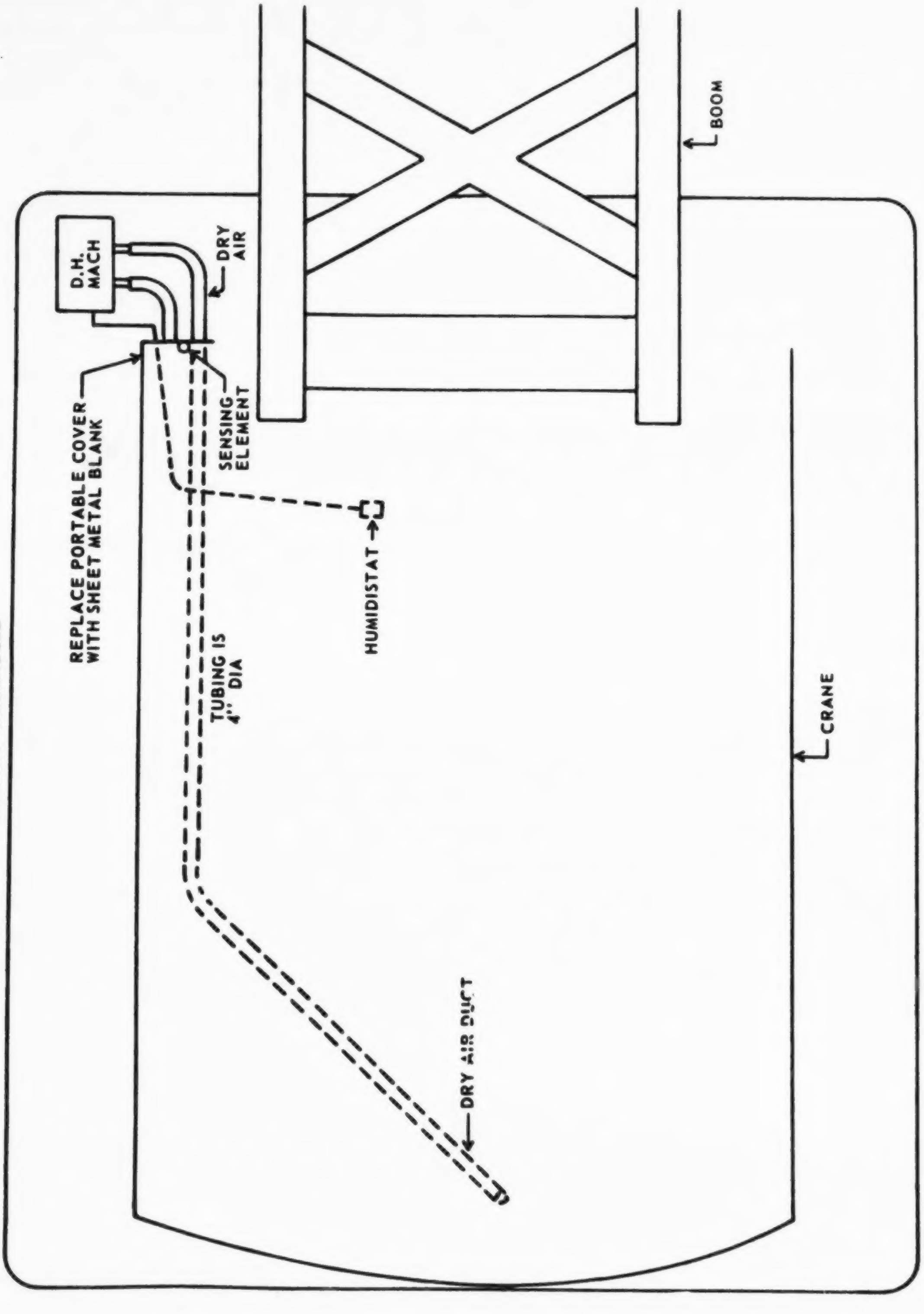
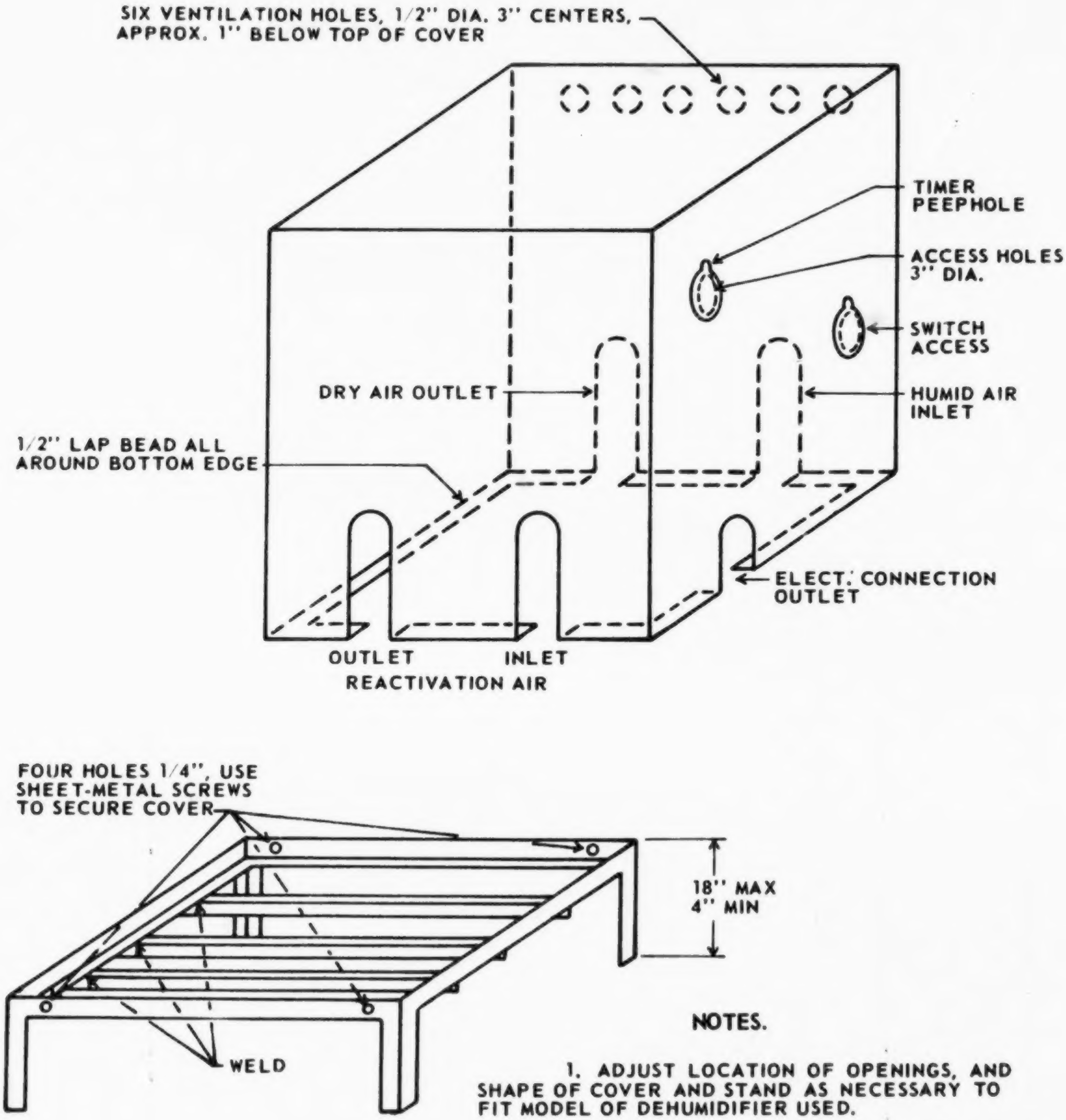


Figure 55. D. H. piping for crane cab.


SIX VENTILATION HOLES, 1/2" DIA. 3" CENTERS, APPROX. 1" BELOW TOP OF COVER
TIMER PEEPHOLE
ACCESS HOLES 3" DIA.
SWITCH ACCESS
DRY AIR OUTLET
HUMID AIR INLET
1/2" LAP BEAD ALL AROUND BOTTOM EDGE
ELECT. CONNECTION OUTLET
OUTLET
INLET
REACTIVATION AIR
FOUR HOLES 1/4", USE SHEET-METAL SCREWS TO SECURE COVER
18" MAX
4" MIN
WELD

NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 56. Typical cover and stand for dehumidifier

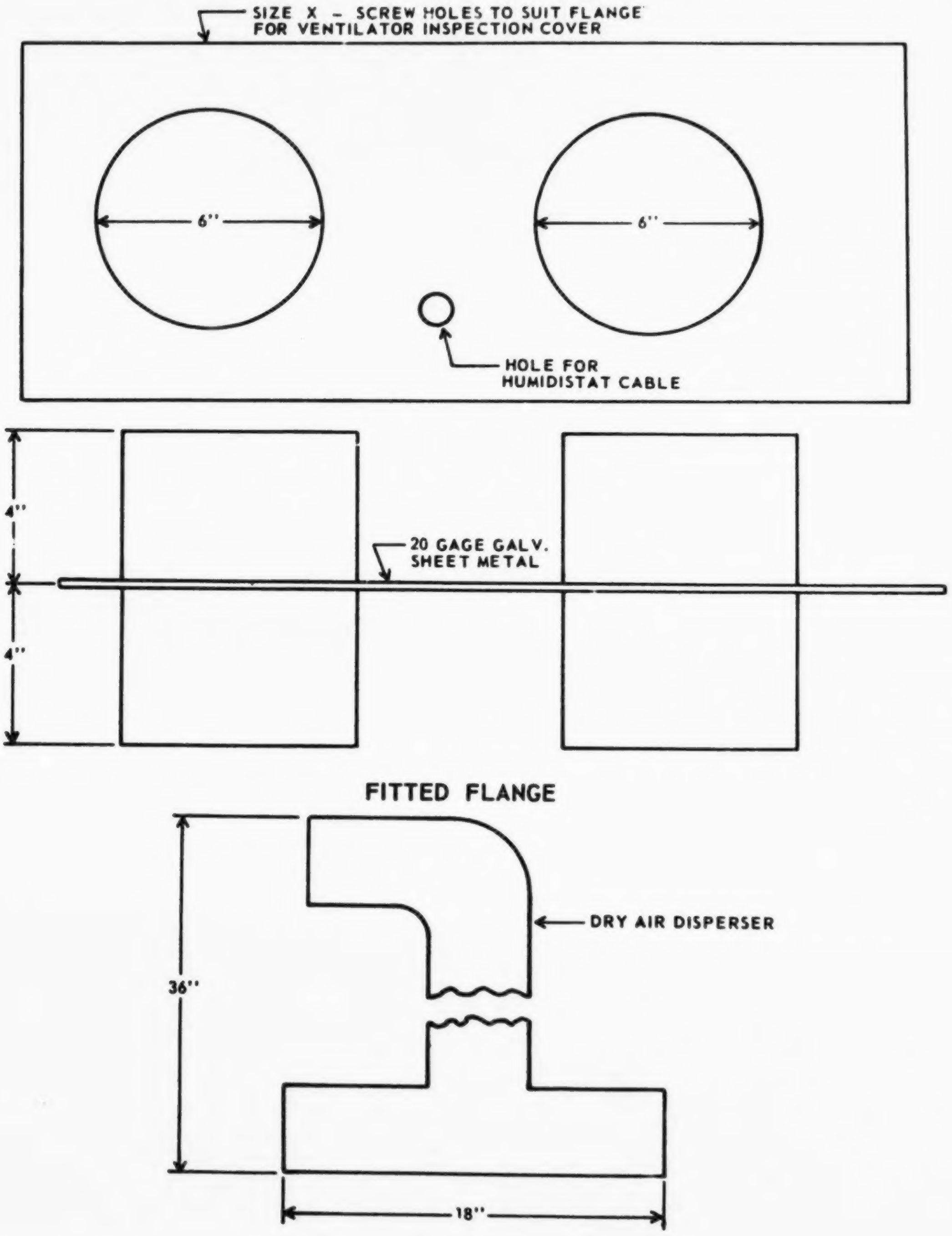

SIZE X – SCREW HOLES TO SUIT FLANGE FOR VENTILATOR INSPECTION COVER
6"
6"
HOLE FOR HUMIDISTAT CABLE
4"
4"
20 GAGE GALV. SHEET METAL
FITTED FLANGE
DRY AIR DISPERSER
36"
18"

Figure 57. Fitting for D. H. piping.

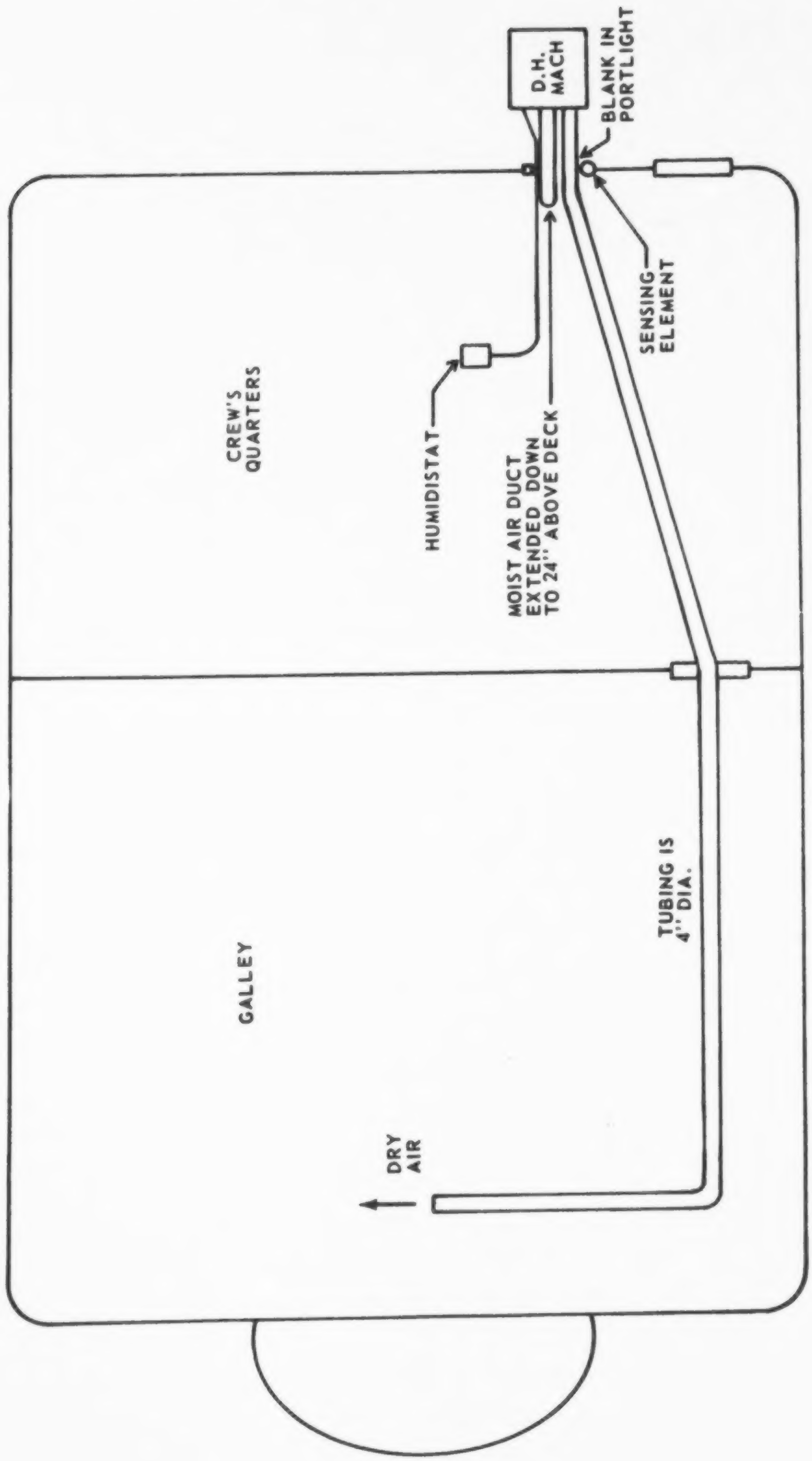


Figure 58. D. H. piping for aft deck house.

APPENDIX Q
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR BOAT, PICKET, STEEL, DIESEL ENGINE DRIVEN DESIGN 4003

1. General. This appendix provides detailed instructions for preparation of the picket boat, design 4003, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.* The following items will be removed, identified and stowed in the dehumidified area:

(1) Anchor, anchor fittings and rope.
(2) Handrailing and stanchions.
(3) Horn and bell.
(4) Stern light and staff.
(5) Navigation lights.
(6) Windshield wiper assemblies.
(7) Mast and jackstaff.
(8) Deck wrenches.
(9) Canvas covers.
(10) Life float.
(11) Hand bilge pump.
(12) Void compartment and rope locker access covers.
(13) Searchlight.
(14) Window glass.
(15) Emergency tiller.

b. Ventilation. The access covers to the rope locker and the voil compartment under the cockpit will be removed as specified in a *a* above. The resulting openings will be blanked, and the blanks provided with gooseneck-or turbine-type vents. The gratings for the access covers may be used in lieu of the ventilators when the boats are stored under shelter. Hull plugs to the void compartments will be removed and secured adjacent to the openings.

c. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The washroom, quarters forward, engineroom, and cabin will be prepared for dehumidification as a single zone.

(2) *Provisions for air circulation.* The door to the washroom, all locker doors, access cover to engineroom in cabin passage, the port and starboard bunk covers in the cabin, and the wood access cover on steering console will be secured in an open position to permit circulation of the dehumidified air.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin.

(a) Dehumidified area. Edges of doors, portlights, windows, hatch covers, and all other openings, in the nature of seams or joints between closely opposed surfaces, which give access to the dehumidified area will be sealed with strippable coating and bituminous coating. When sealing portlights, extend the strippable coating outward, over adjacent surfaces of the bulkheads.

(b) Propeller shafting. Apply a seal of strippable coating around the propeller shaft at the stern tubes and at both ends of the strut bearings.

(c) Cowl vents. The cowl vents will be fitted with minimum No. 26 gage galvanized sheet metal blanks and sealed with strippable coating and bituminous coating.

(d) Steering cable. The opening for the steering cable, at bulkhead aft of the engine compartment, will be sealed with strippable coating and bituminous coating.

(e) Louvered vents. The two louvered vents will be fitted with minimum No. 26 gage, galvanized sheet metal blanks or exterior grade plywood blanks, properly secured, and sealed with strippable coating and bituminous coating.

(f) Hull openings. All openings in the hull, with the exception of deck drains aft, will be fitted with minimum No. 26 gage, galvanized sheet metal blanks and sealed with strippable coating and bituminous coating.

(g) Dehumidification piping system. The points of entry of all air ducts into compartments, the connecting joints of all air ducts (including construction seam of the tubing) will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the tubing or ducts.

(h) Sluice valve. The sluice valve in way of the forward bulkhead of the engine compartment will be secured in a closed position.

(4) *Dynamic dehumidification installation.*

(a) Dehumidification machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volts, alternating current, will be installed, generally, as shown on figure 59. The machine will be mounted on a stand and protected with a cover fabricated, generally, as shown on figure 61. The machine will not service more than a group of four boats.

(b) Air duct. Tubing, 4-inch diameter, No. 26 gage, with necessary fittings, supports and connections, will be installed. Connection of ducts to the dehumification machine will be made by

unions or slip joint connections, which permit easy removal of the machine for servicing. All materials will be galvanized.

(c) Duct extensions. Moist air will be removed from the lower portions of the interior of the boats by the use of duct extensions. The extensions will be 4¾-inch diameter flexible hose conforming to MIL Spec H-8796. The flexible hose will extend from the moist air return connection on each boat to approximately 18 inches above the water closet floor or the engineroom deckplates, as applicable.

(d) Duct installation. A glass will be removed from the aft end of the cabin of each boat, port or starboard side, as applicable, and stored as specified in *a* above. Minimum No. 26 gage, galvanized sheet metal or exterior grade plywood blanks provided with openings to suit duct and sensing element installation will be fitted in the way of the glass removals. The blank in the vent for the water closet will be provided with an opening, to permit the entrance of an air duct. Ductwork and extensions will run, generally, as shown on figures 59 and 60.

(e) Ductwork supports. Ductwork will be supported on wood or metal stanchions. The duct will be fastened to the stanchions by galvanized strapping.

(f) Humidistat. A hair-type humidistat will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified area. The humidistat will be installed in the cabin of the boat from which the humid air ductwork is connected to the dehumidification machine. The humidistat will be mounted approximately 24 inches above the engine compartment deck level and approximately 3 feet from the intake end of the moist-air return flexible hose. The manufacturer's instructions will be followed in making electrical connections. The humidistat will be connected to the dehumidification machine by means of No. 18, 2-conductor, rubber covered cable with suitable terminal connectors.

(g) Sensing elements. Humidity sensing elements will be mounted in a way of the metal blank on the aft cabin window on each boat, with cable extending into the machinery compartment. The element will be secured against movement.

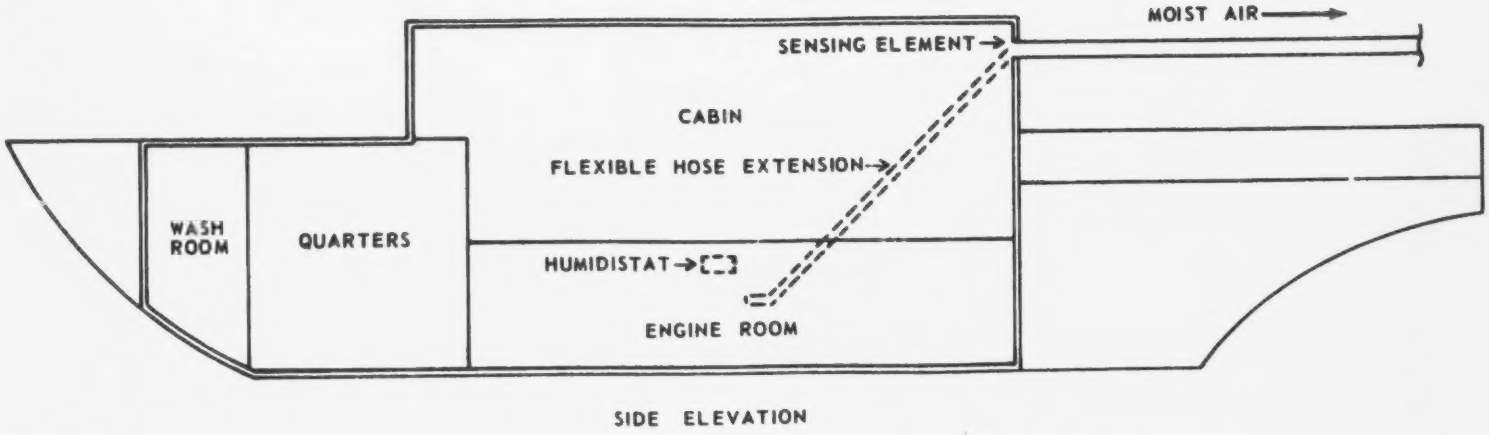


Figure 59. Dehumidification, design 4003.

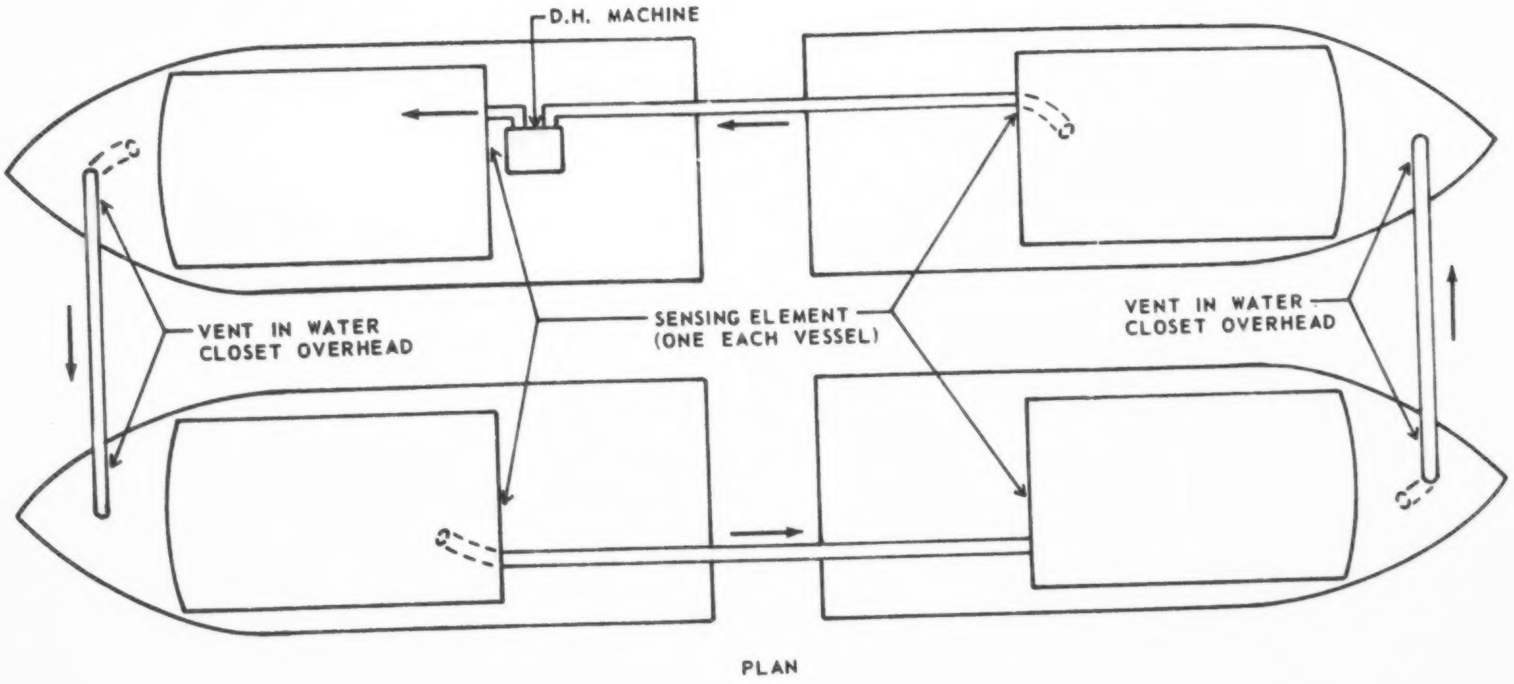
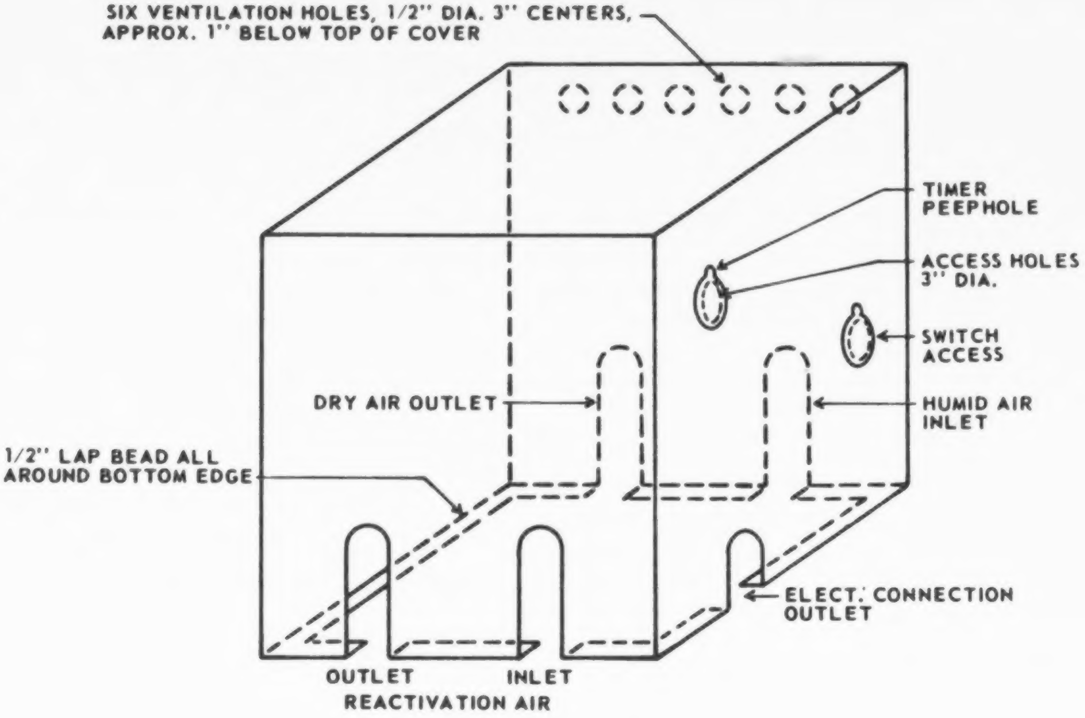
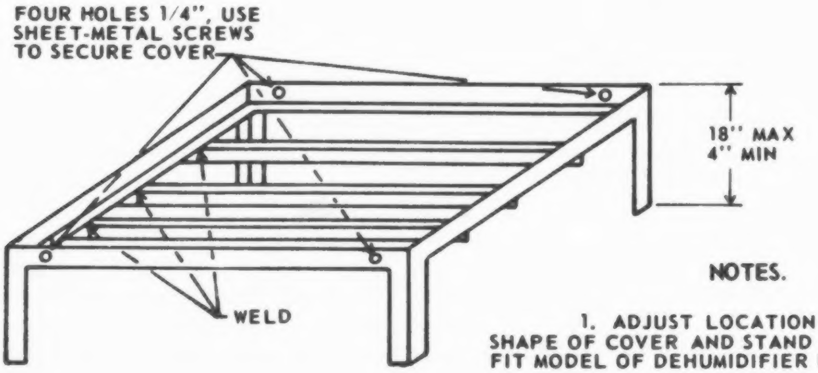

D.H. MACHINE
SENSING ELEMENT (ONE EACH VESSEL)
VENT IN WATER CLOSET OVERHEAD
VENT IN WATER CLOSET OVERHEAD
PLAN

Figure 60. Dehumidification, design 4003.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 61. Typical cover and stand for dehumidifier.

APPENDIX R

DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR BOAT, UTILITY, DIESEL, 26 FOOT

DESIGN 6009

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1. General. This appendix provides detailed instructions for preparation of the utility boat, design 6009, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and stowage.*

(1) *Cockpit.* The following items will be removed, identified and stowed in the cockpit:

- (a) Hoisting sling.
- (b) Ensign staff.
- (c) Anchor and line.
- (d) Main engine covers.
- (e) Canopy with windshield assemblies.
- (f) Horn.
- (g) Bell.
- (h) Bow light.

(2) *Exhaust manifold.* The clean out plugs will be removed from the manifold, bagged, identified, and secured to the manifold. The flexible section of the exhaust pipe will be removed and secured in other than operating position.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The complete interior of the boat will be prepared for dynamic dehumidification.

(2) *Cockpit cover.* A No. 20 gage, galvanized sheet metal cover will be fabricated to encase the entire interior of the boat. The cover will be fabricated in three sections. The center section will be positioned over the engine. The edges of the cover will extend down over the deck coaming and will rest on the deck. The underside of the cover will be fitted with 1/8-x 1-x 1-inch galvanized angles, which will run from coaming to coaming, and will be notched at the ends to fit over the coaming, generally, as shown on figure 63. The sections will be secured to the coaming with clamps fabricated, generally, as shown on figure 63. The cover will be provided with holes, of sufficient size, to provide for the introduction of the dehumidification ductwork and for the mounting of a sensing element contact.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are outlined below:

(a) *Rudder and shaft.* Using strippable coating and bituminous coating, a seal will be placed at the stern tube and at the rudder post.

(b) *Fuel fill deckplate.* The fuel fill deckplates will be sealed with strippable coating and bituminous coating.

(c) *Hull and deck penetrations.* All exterior openings in the hull and deck leading to dehumidified areas will be closed with caps, plugs, blanks, or pressure-sensitive tape, and sealed with strippable coating and bituminous coating.

(d) *Cockpit cover.* Apertures between the coaming and the deck and all other joints and seams will be sealed with strippable coating and bituminous coating.

(e) *Dehumidification piping system.* The connecting points of all air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around flanges, adapters, and other devices used to attach or introduce the ducts. All joints and seams in the ducts will be similarly sealed.

(4) *Dehumidification installation.* A dynamic dehumidification system will be installed for the interior of the boats. Normally one dehumidification machine will service four boats, generally, as shown on figure 62.

(a) *Dehumidification machine.* A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current, will be installed, generally, as shown on figure 62. The machine will be mounted on a stand and protected with a cover fabricated, generally, as shown on figure 64. An extension, terminating in a 90° elbow, will be fitted to the reactivation air outlet on the dehumidification machine in order to extend the outlet beyond the exterior side of the sheet metal cover. The elbow will be turned away from the reactivation air inlet side and turned downward 45 ° to prevent the entry of water.

(b) *Duct installation.* Four-inch-diameter, No. 26 gage, galvanized sheet metal ducts, with necessary ells, reducing fittings, and connections will be installed, generally, as shown on figure 62. Suitable penetrations, large enough to permit the introduction of the air ducts and the mounting of a sensing element, will be provided in the cockpit cover of each boat. The dry air will penetrate one end of the cover and will be removed from the opposite end.

(c) *Ductwork supports.* Ductwork run on the deck will be supported on wood or metal stanchions. The ducts will be secured to the stanchions by galvanized metal strapping.

(d) *Machine connections.* Connections of ducts to the dehumidification machine will be made with unions or slip joint connections, which permit easy removal of the machine for servicing.

(e) *Humidistat.* A hair-type humidistat will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified areas. The humidistat will be installed in the cockpit of the boat, from which the moist-air ductwork is connected to the dehumidification machine. The humidistat will be mounted so that it is protected against movement and damage. Rubber covered electrical cable, with suitable terminal connectors, will be installed to connect the humidistat to the dehumidification machine. Provisions will be made to prevent movement of the cable at the point where it leaves the dehumidified area.

(f) *Sensing elements.* Humidity sensing elements, without cable, will be installed, generally, as shown on figure 62. One sensing element will be mounted in the cockpit cover of each boat.

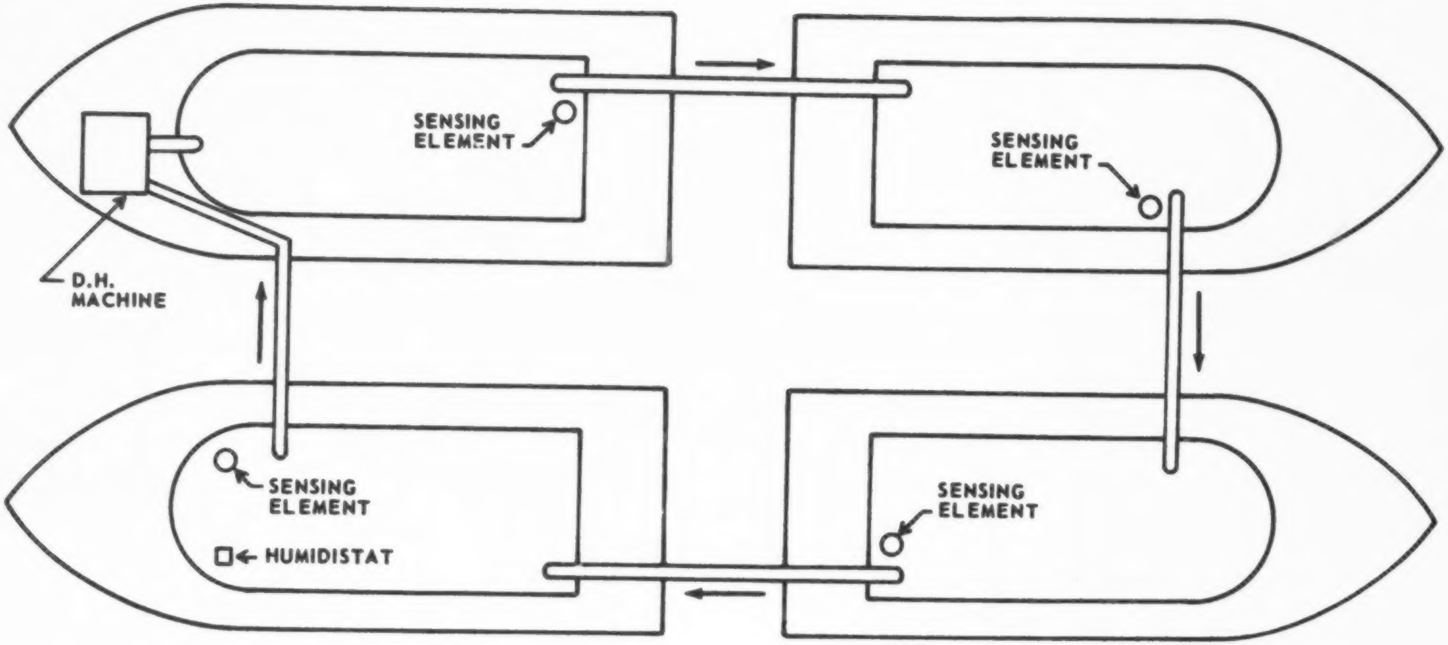


Figure 62. Dehumidification system for design 6009.

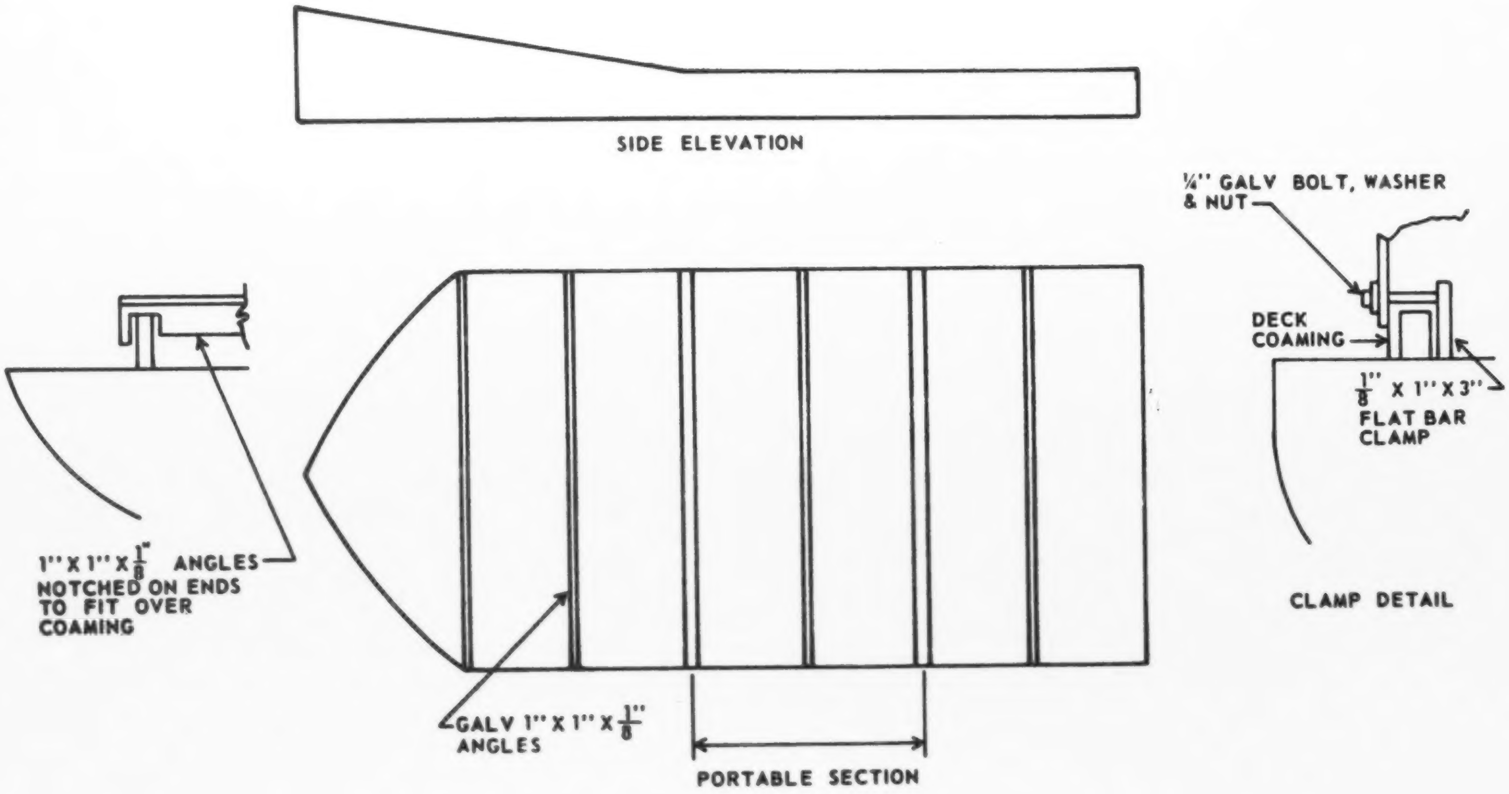
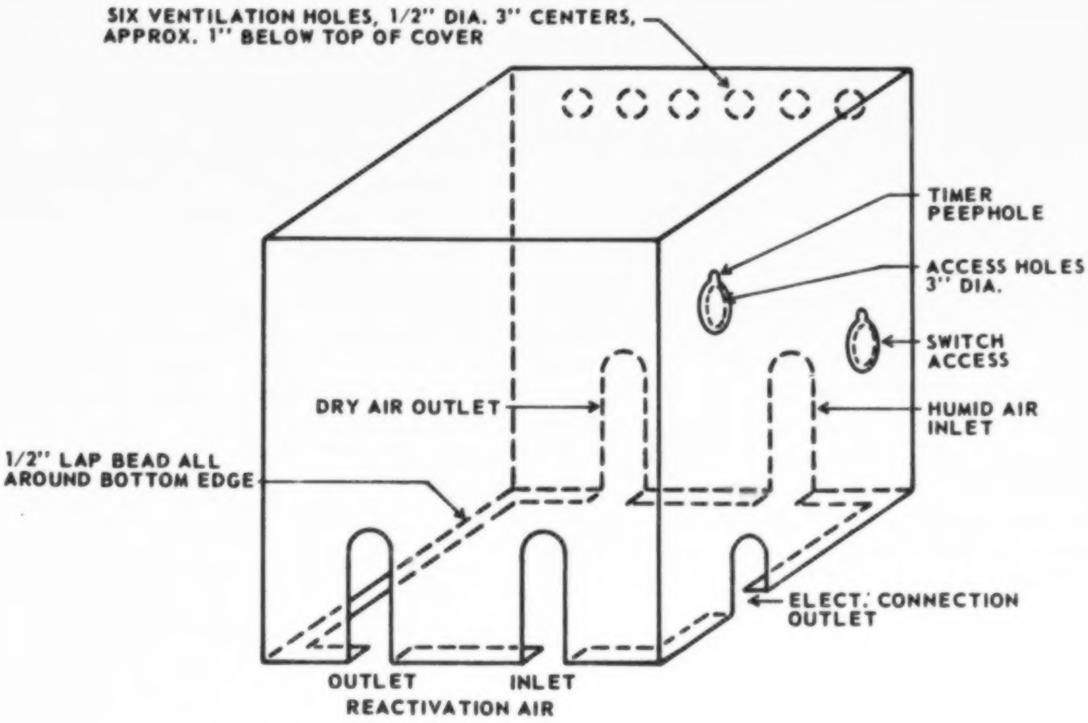
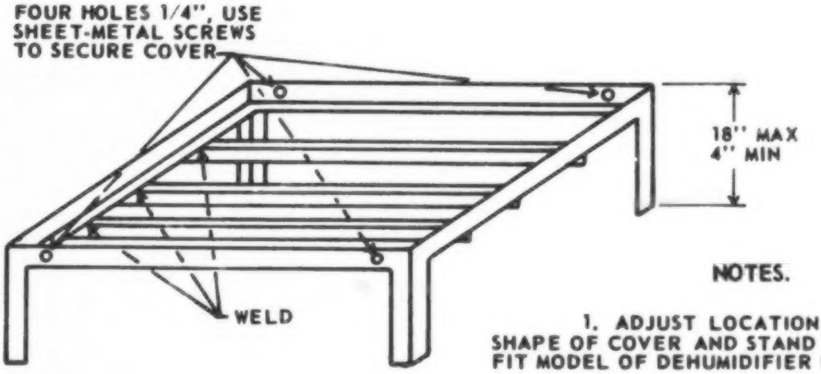

SIDE ELEVATION
1/4'' GALV BOLT, WASHER & NUT
DECK COAMING
1/8'' X 1'' X 3'' FLAT BAR CLAMP
CLAMP DETAIL
1'' X 1'' X 1/8'' ANGLES NOTCHED ON ENDS TO FIT OVER COAMING
GALV 1'' X 1'' X 1/8'' ANGLES
PORTABLE SECTION

Figure 63. Cockpit cover for design 6009.





NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 64. Typical cover and stand for dehumidifier.

APPENDIX S

DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR BOAT, PASSENGER AND CARGO DIESEL, STEEL, 65-FOOT, 6-INCH DESIGN 2001

1. General. This appendix provides detailed instructions for the preparation of the passenger and cargo boat, design 2001, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Pilothouse.* The following items will be removed, identified, and stowed in the pilothouse:

(a) Windshield wiper.

(b) Pilothouse ventilator screens.

(2) *Lazarette.* The following items will be removed, identified, and stowed in the lazarette:

(a) Navigation lights.

(b) Searchlights.

(c) Cargo floodlights.

(d) Blinker light.

(e) Horn.

(f) Canvas covers (all).

(g) Handwheel and dogging mechanism (cargo hold access scuttle).

(h) Anchor and lifeboat falls.

(i) Toggle pins and chains for railing and staffs.

(j) Lifelines and stanchions.

(k) Running rigging and halyards.

(l) Galley exhaust vent and galley range smokepipe.

(m) Towing trolley, tiller access plate and lubricating oil vent screen.

(3) *Passenger quarters.* The following items will be removed, identified and stowed in the passenger quarters:

(a) Cargo hatch battens (wood).

(b) Cargo hatch wedges and chains.

(4) *Cargo hold.* The following items will be removed, identified, and stowed in the cargo hold:

(a) Lifeboat.

(b) Life rafts.

(c) Lifeboat chocks and gripes.

(d) Life raft chocks and gripes.

(e) Lifeboat davits, except those with welded cleats.

(f) Anchor davit.

(g) Jackstaff.

(h) Scuttle and deck plate key.

(i) Forepeak and cargo hold scuttle cover and strongback.

(5) *Engineroom.* The cargo winch engine and sprocket chains will be removed, identified, and stowed in the engineroom.

(6) *Chain locker.* The anchor chains will be disassembled from the anchors and stowed in the chain locker.

b. Preparation for Dynamic Dehumidification.

(1) *Dehumidified area.* The engineroom, pilothouse, main deckhouse, lazarette, and crew's quarters will be prepared for dynamic dehumidification.

(2) *Ventilated spaces.* Ventilation will be provided for the forepeak and cargo hold access scuttles. A 6-inch-high, No. 12 gage, galvanized sheet metal coaming will be fabricated and installed in the recess around the scuttle opening. The diameter of the coaming will be approximately equal to the major diameter of recess. The coaming will be bedded on bituminous coating in the recess, and additional bituminous coating will be applied, in the form of a fillet, around the outside junction of the coaming and the deck. A ventilated shelter, painted as specified herein, will be fabricated and installed over each of the open scuttles. The shelters will be fabricated of nominal 1-inch lumber, or ½-to 5/8-inch, exterior-type plywood, grade A/C, and will include the features shown on figure 65. The louvered face will be covered with standard, aluminum, insect screen. The shelter for the hatch scuttle will be of sufficient size to contain the scuttle and the cover in open position. The shelters will be secured by wiring to convenient points such as vent pipes.

(3) *Waterproofing of cargo hatch.* The cargo hatch will be covered with 30-pound roofing paper. Joints will be overlapped 6 inches and made tight with

roofing cement. The paper will be carried down all sides of the hatch and secured with rough 2-x 4-inch lumber, in lieu of hatch cover battens. The lumber will be secured with wedges. The metal batten straps will be applied over the roofing paper.

(4) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidication will be in accordance with this bulletin. Detailed sealing requirements are as follows:

(a) Stack. A galvanized sheet metal blank, minimum No. 26 gage, generally in the shape of the stack opening, but long enough to engage under the forward and aft areas of the stack lip, will be fabricated and sprung into position. A piece of muslin, target cloth, or similar material will be draped over the stack, fitted snugly down the sides, and secured below the top bead by pressure-sensitive tape applied as a band around the stack. The stack drain hoses will be masked with pressure-sensitive tape. The stack side vents will be shielded with plywood or sheet metal covers secured with suitable demountable fasteners. The covered areas will be coated with strippable coating and bituminous coating.

(b) Vents, valves, piping, drain, and other openings. Existing covers will be closed, and the items will be sealed with strippable coating, except those used in the dehumidification system.

(c) Doors, windows, and portlights. Perimeters of exterior doors, windows and portlights, except the portlight in the fidley, will be sealed from the outside with strippable coating. The portlights in the crew quarters may be sealed from the outside.

(d) Scuttles and access hatches. The perimeters and center recesses of scuttles to the engineroom and crew's quarters, and one of the access hatches to the crew's quarters and lazarette, will be sealed with strippable coating and bituminous coating.

(e) Miscellaneous sealing. CO_2 system nozzles in the cargo hold will be taped, coated with strippable coating and tagged. Points of entry of steering cable into cargo hold and pilothouse will be sealed with strippable coating and bituminous coating.

(f) Dehumidification piping system. The points of entry of all air tubing and ducts into compartments will be sealed with strippable coating and bituminous coating. Such sealing will be carried over and around flanges, adapter, and othe devices used in attaching or introducing the air tubing. All joints in the air tubing will be similarly sealed.

(g) Anchor windlass. The opening between the clutch engaging mechanism and the gypsy head will be sealed with strippable coating. The windlass will be covered with a piece of canvas, and the canvas will be wired in place.

(h) Windlass speed control box. Sixteen units of bagged desiccant will be placed in the box, and the cover immediately closed. The cover and operating handle extension through the box will be sealed with strippable coating. The cover will be stenciled, "DESICCANT INSERTED (MONTH) (YEAR)".

(5) *Provisions for air circulation.* Within the areas being dehumidified, interior doors, galley range, and refrigerator doors will be secured in open position, Covers to lockers, tanks, and void spaces will be removed and secured adjacent to their places of use.

(6) *Dynamic dehumidification installation.* A dynamic dehumidification system will be installed to provide dynamic dehumidification of the engineroom, pilothouse, main deckhouse, lazarette, and crew quarters. Dry-air lines and moist-air return lines will be run to the lazarette, the crew quarters, and the main deckhouse, generally, as shown on figure 66.

(a) Dehumidification machine. A package dehumidifier, single desiccant bed, absorbent type, 10,000 cubic feet capacity, 110-volt, alternating-current, will be installed, as shown on figure 66. The machine will be mounted on a stand and protected by a cover fabricated in accordance with figure 67.

(b) Air duct installation. Four-inch, No. 26 gage, galvanized tubing, with necessary ells, tees, reducing fittings, supports, and connections, will be installed. Ducts will run with a minimum of bends and approximately as shown on figure 66. Connections of the air ducts to the dehumidification machine will be made with unions or slip joint connections, which permit easy removal of the machine for servicing. The air ducting to the various compartments will be as follows:

1. Crew quarters. The dry-air connection for the crew's quarters will be made to the toilet vent. The moist-air connection will be made to the galley intake vent. A 6-inch diameter extension approximately 6 feet long will be installed as shown in figure 66 (revised).

2. Main deckhouse, pilothouse and engineroom. The louvered battery space vent shall be covered with a blank fabricated from No. 18 gage galvanized sheet metal or 1/2-inch-thick exterior grade plywood, and secured in place by the use of hookbolts. The blank shall have one 4-inch-diameter cutout to recieve the dry-air duct. The dry-air connection may terminate at the blank or may extend a short distance into the pilothouse.

3. Lazarette. The 2-inch-diameter aft hold drain piping between the lazarette and engineroom will be opened to permit dry-air circulation between engineroom forward area by the way of the removed drain opening in lazarette through the opened fresh water tanks and water fill pipe as shown in figure 66 (revised).

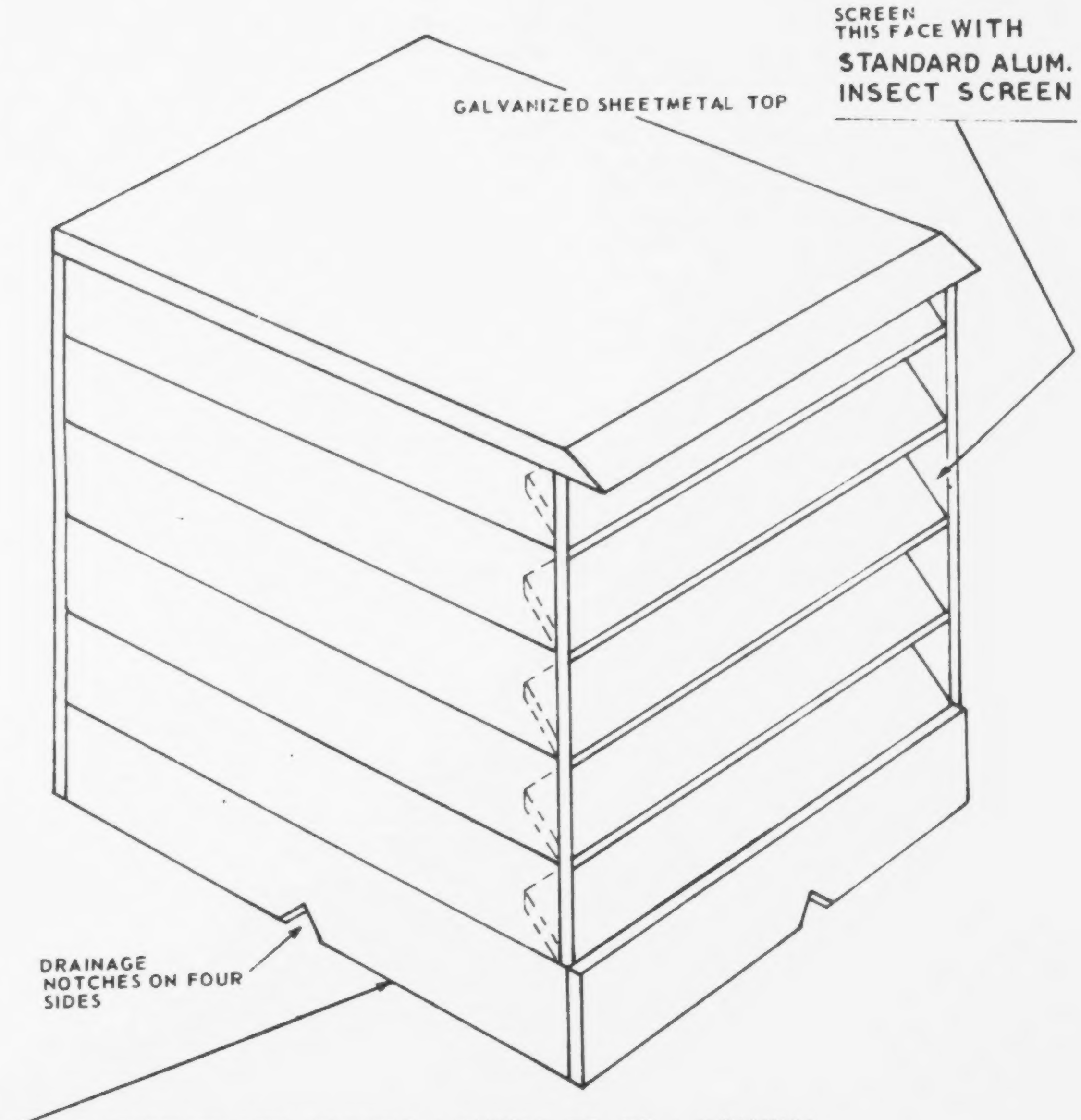
(c) Humidistat. A hair-type humidistat will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified areas. The humidistat will be installed in the engineroom approximately 3 feet above the floor plate level and 3 feet from the moist-air duct openings. It will be securely fastened to a bracket attached to the pump engine or other convenient structure. The manufacturer's instructions will be followed in making the electrical connections. The humidistat will be connected to the dehumidification machine by means of No. 18, two-conductor, rubber covered cable with suitable terminal connectors. The cable will run from the humidistat, through the fidley portlight cover, to the dehumidification machine.

(d) Sensing elements. Humidity sensing elements will be installed, one each, in the engineroom, the crew quarters and the lazarette. The sensing elements will be installed as follows:

1. Crew quarters. The galley intake vent will be covered with a blank fabricated from No. 18 gage sheet metal, or ¼-inch exterior grade plywood. The blank will be provided with an opening to receive the moist-air return duct. The sensing element will be mounted in the side of the duct just above the connection to compartment opening. The sensing element will run down inside the duct and will be supported clear of the ends of the duct in a manner to secure it against motion and contact with metal or other conducting surfaces.

2. Engineroom. The lube oil tank vent opening will be covered with a blank fabricated from No. 18 gage galvanized sheet metal, or ¼-inch exterior grade plywood. The blank will be provided with bolt holes to match existing bolts and with a hole for mounting the sensing element contact. The union in the lube oil fill line will be broken, and the sensing element will pass through the fill line into the engineroom as far as the cable permits. The element will be secured to prevent motion and contact with metal or other conducting surfaces.

3. Lazarette. The tiller access cover plate shall be removed and covered with a blank fabricated from No. 18 gage galvanized sheet metal, or 1/4-inch exterior grade plywood. The blank will be proivded with a hole for passage of the sensing element cable. The sensing element contact will be mounted in such a manner that it does not fit flush with the deck. The sensing element will pass downward, through the blank as far as the cable permits and will be secured against motion and contact with metal or other conducting surfaces.


SCREEN THIS FACE WITH STANDARD ALUM. INSECT SCREEN
GALVANIZED SHEETMETAL TOP
DRAINAGE NOTCHES ON FOUR SIDES

ALL TONGUE AND GROOVE LUMBER TO BE 1 NOMINAL

ALL EXTERIOR GRADE PLYWOOD TO BE 1/2 TO 5/8 INCH NOMINAL

NOTE: ALL WOODEN SURFACES TO BE PAINTED AS SPECIFIED HEREIN

Figure 65. Ventilated cover.

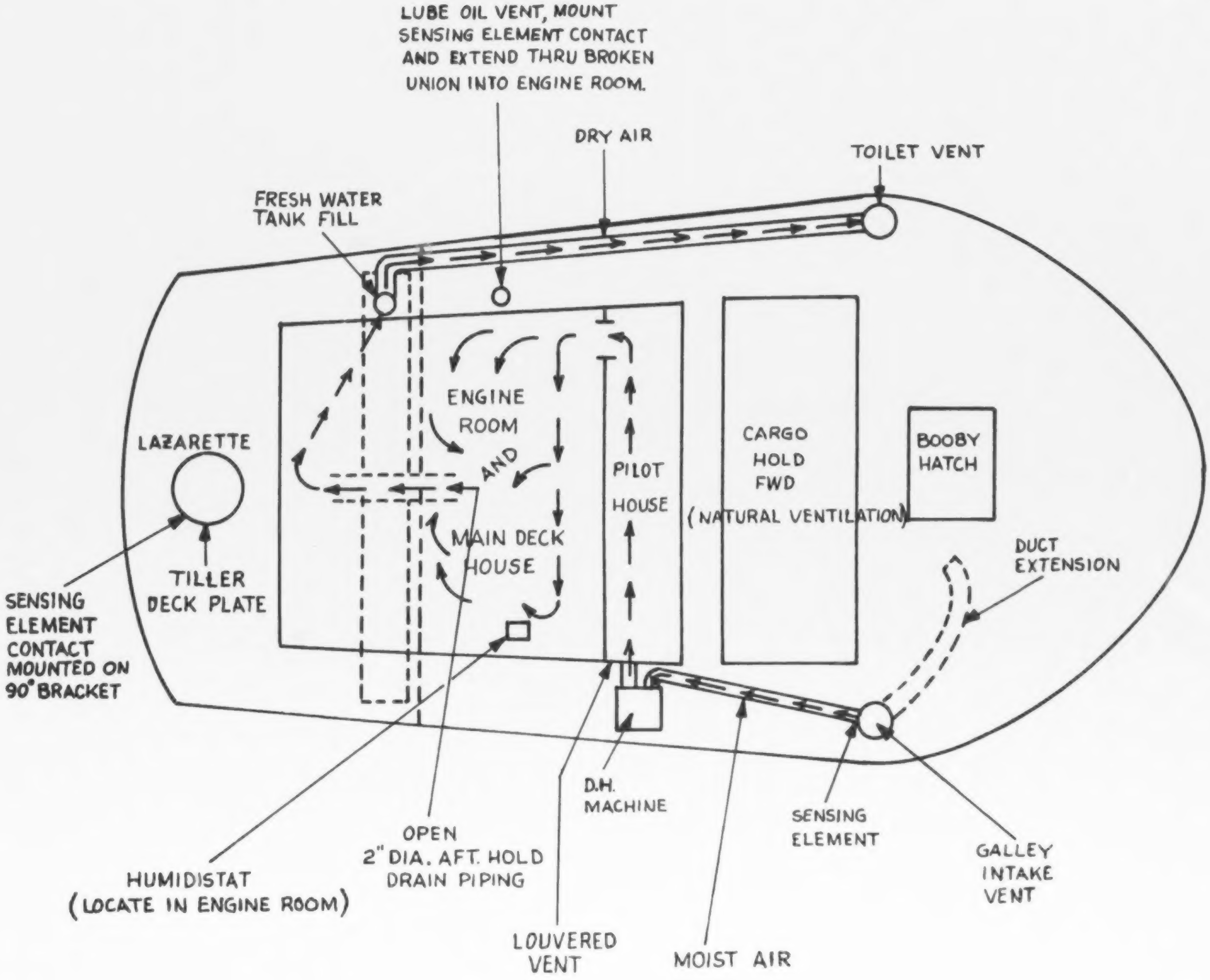
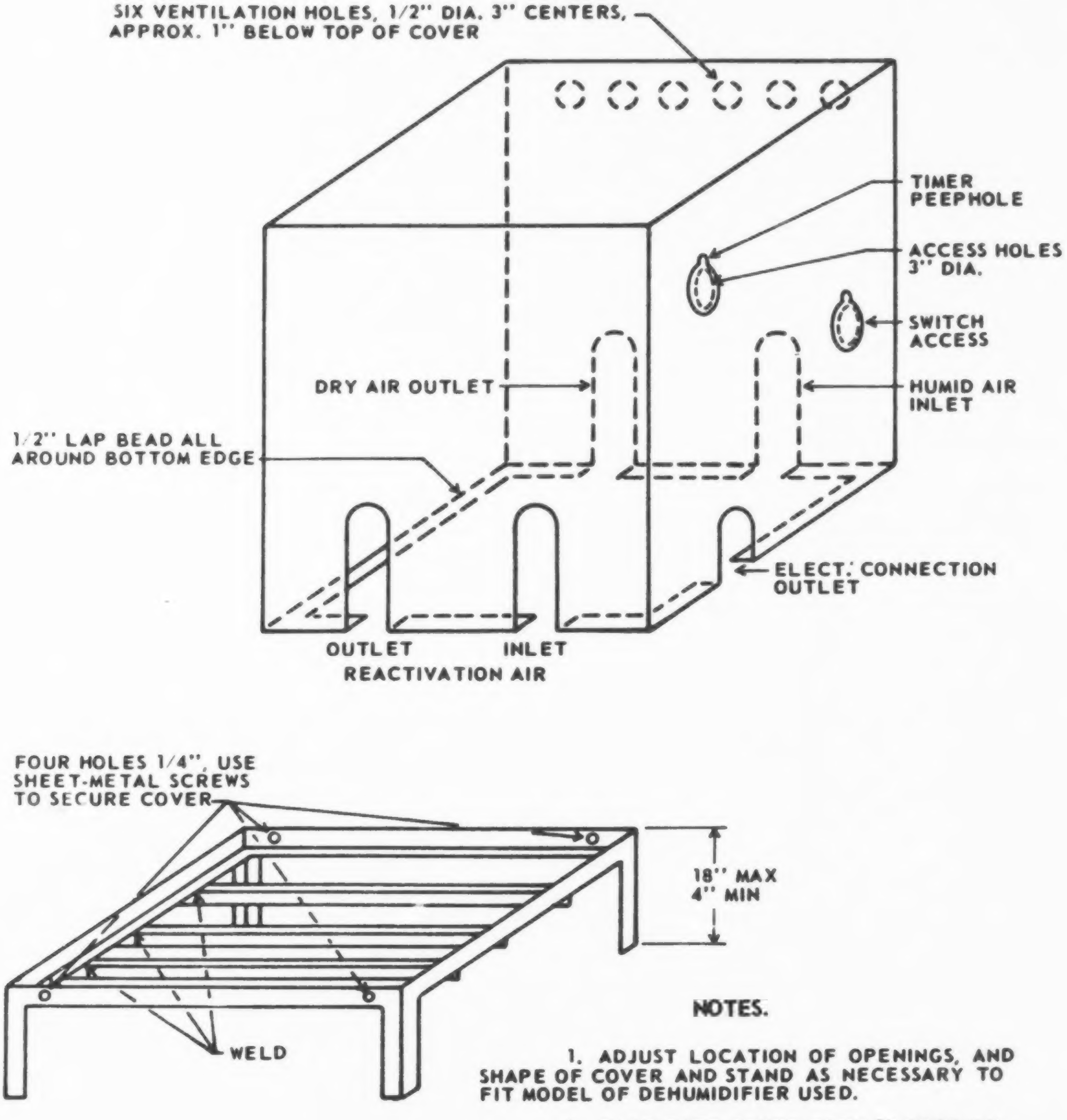

LUBE OIL VENT, MOUNT SENSING ELEMENT CONTACT AND EXTEND THRU BROKEN UNION INTO ENGINE ROOM.
DRY AIR
TOILET VENT
FRESH WATER TANK FILL
LAZARETTE
ENGINE ROOM AND MAIN DECK HOUSE
PILOT HOUSE
CARGO HOLD FWD (NATURAL VENTILATION)
BOOBY HATCH
DUCT EXTENSION
TILLER DECK PLATE
SENSING ELEMENT CONTACT MOUNTED ON 90° BRACKET
D.H. MACHINE
SENSING ELEMENT
GALLEY INTAKE VENT
OPEN 2" DIA. AFT. HOLD DRAIN PIPING
HUMIDISTAT (LOCATE IN ENGINE ROOM)
LOUVERED VENT
MOIST AIR

Figure 66. Dehumidification system for Design 2001 (revised).


SIX VENTILATION HOLES, 1/2" DIA. 3" CENTERS, APPROX. 1" BELOW TOP OF COVER
TIMER PEEPHOLE
ACCESS HOLES 3" DIA.
SWITCH ACCESS
DRY AIR OUTLET
HUMID AIR INLET
1/2" LAP BEAD ALL AROUND BOTTOM EDGE
ELECT. CONNECTION OUTLET
OUTLET
INLET
REACTIVATION AIR
FOUR HOLES 1/4", USE SHEET-METAL SCREWS TO SECURE COVER
18" MAX
4" MIN
WELD

NOTES.

1. ADJUST LOCATION OF OPENINGS, AND SHAPE OF COVER AND STAND AS NECESSARY TO FIT MODEL OF DEHUMIDIFIER USED.

2. FABRICATE COVER FROM 20 GAGE GALVANIZED SHEET METAL.

3. FABRICATE STAND FROM 1 x 1 x 1/8 INCH GALVANIZED STEEL ANGLES.

Figure 67. Typical cover and stand for dehumidifier.

APPENDIX T

PRESERVATION AND STORAGE INSTRUCTIONS FOR SELF-ELEVATING BARGES AND PIERS

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1. **General.** This appendix provides detailed preservation instructions and storage requirements for self-elevating barges and piers for long-term storage. These requirements are considered adequate for six sizes of prefabricated steel barges adopted for military use.

2. **Preparation Instructions.** *a. Barge.* The barge will be stored in wet storage elevated on and welded off to the caissons about 12 feet above high water tide, as shown on figure 68. This height will permit underbody (bottom) surveillance and periodic maintenance. The jacks will be removed from the barge, stored, and preserved as specified. The manhole covers and bottom compartment plugs will be removed to permit circulation of air throughout the compartments. The opening left by the removal of the manhole covers will be blanked with 1/2-inch exterior grade or marine plywood. The fitted plywood blanks will be provided with an opening of sufficient size to permit installation of a 6-inch, flanged, gooseneck, galvanized sheet metal ell with standard insect wire mesh cover. Bituminous coating and strippable compound will be troweled on the top side of the plywood blank to a thickness that is higher than the coaming to assure water run-off. The removed manhole covers, gaskets, and drain plugs will be packed in wood boxes conforming to PPP-B-621, style optional, identified, and stowed in the cargo hold. Cleaning and painting of the barge will be in accordance with TB 43-0144.

b. Wood Decking (Planking). The wood decking will be treated with wood preservative conforming to MIL-W-18142, type B.

c. Pneumatic Jacks.

(1) *Stored in open storage.* The exposed shafts of the retractor cylinders will be coated with type P-11 preservative. Valves, fittings, and couplings will be closed. The opening in the top of the jack will be blanked with 1/2-inch exterior grade or marine plywood. The plywood blanks will be fitted in such a manner as not to cover or prevent the use of the lifting eyes. The bottom opening in the jacks will be blanked with a circular close fitting pan constructed of No. 20 gage galvanized sheet metal. Cushioning material will be applied to all sharp edges and projections of the jack prior to inclosing the jack in the plastic cocoon-type shroud. The jack will be covered with a snug-fitting shroud of osnaburg cloth, conforming to CCC-C-429.

NOTE

Do not allow osnaburg cloth to cover jack tie down bar supports. The tie down supports will be left open to permit installation of tie down bars when jacks are installed and secured to deck pad eyes for sea tow. The shroud will be fastened to the plywood blank and pan with adhesive, conforming to MMM-A-189. Following the installation of the osnaburg cloth, it will be sprayed with one coat of sprayable plastic, .025-inch thick, conforming to type I, class 2 of MIL-C-3254, followed by one coat of bituminous coating, .125-inch thick, conforming to type II of MIL-C-3254, and one coat of aluminum coating, .002-to .003-inch thick, conforming to type III of MIL-C-3254.

NOTE

Allow a minimum of 24 hours drying time between the application of each coating. Jacks protected in this manner will be stored ashore on 12-x 12-or 14-x 14-inch timbers, with the bottom and top blanks fitted with flanged-type, 4-inch vents with wire mesh covers. The vent in the top blank will be of the gooseneck design to prevent direct entry of water. The vent in the bottom pan will be of a tapered design to permit drainage of accumulated moisture due to condensation. Vents will be equipped with insect screen covers.

NOTE

THIS IS A VENTED PACK. DESICCANT OR D/H MACHINES ARE NOTREQUIRED FORTHIS PACKAGE.

(2) *Stored in covered storage (warehouse, hangers, or closed sheds).* The jacks will be

preserved in the same manner as that prescribed for open storage, except that the top plywood blanks and bottom pan, and plastic watershed will not be required. Jacks will be stored on timber dunnage.

d. Jack Tie Down Bars and Miscellaneous Hose and other Appurtenances. The jack tie-down bars will be stacked and interleaved with dunnage and stored near or adjacent to the jacks. Hose and other appurtenances will be preserved and packed in wood boxes conforming to PPP-B-621, style optional. The contents of each box will be identified.

e. Caisson. No preservation required. Remove heavy scale and marine growth by using wire brush or scraper.

f. Floodlights. The light standards will be lowered and secured to the deck of the barge. The floodlights will be removed, cushioned to prevent damage to the bulbs and lenses, and packed in wood boxes, conforming to PPP-B-621, style optional. The boxes will be identified and stored under covered storage.

g. Portable Caisson Covers. Clean and paint as specified for barge deck. The covers will be secured to the barge deck or stored ashore on heavy timbers.

h. Jack Guards. Clean and paint as specified for barge deck. The jack guards will be secured to the barge deck or stored ashore on heavy timbers.

i. Fenders: Caissons and Rubber Tire. Rubber tire fenders require no preservation. Store in the cargo hold of the barge. The metal hoops and brackets of the caisson fenders will be cleaned and painted as specified for barge deck. The wood fender components will be treated with wood preservative conforming to MIL-W-18142, type B. The caisson fenders will be secured to the barge deck or stored ashore on heavy timbers.

j. Bridge Spans, Span Support Brackets and "T" Plates. Clean and paint as specified for barge deck. The bridge spans will be stored ashore on heavy timbers. The span support brackets and "T" plates will be stored in the cargo hold or secured to the deck of the barge.

k. Portable Control Panels. The master and local control panels will be individually packaged method IA-14. The packaged controls along with miscellaneous components will be packed in wood boxes conforming to PPP-B-621, style optional, identified, and stored in covered storage.

l. Electrical Components. The exposed ends of electrical boxes, receptacles, and similar components exposed to the weather will be sealed with pressure-sensitive tape conforming to PPP-T-60, type IV.

m. Piping Systems (Air Lines and Reservoirs). The fixed air system and air reservoirs will be drained of all moisture and dried with dry compressed air. Low points will be left open to allow condensation to drain. Deck air fittings will be taped or plugged.

n. Compressors. The compressors, compressor engines, and associated components and accessories will be preserved as specified in chapter 4 of this bulletin. The compressors will be stored under covered warehouse storage.

o. Slings and Miscellaneous Tools. Store in the cargo hold of the barge.

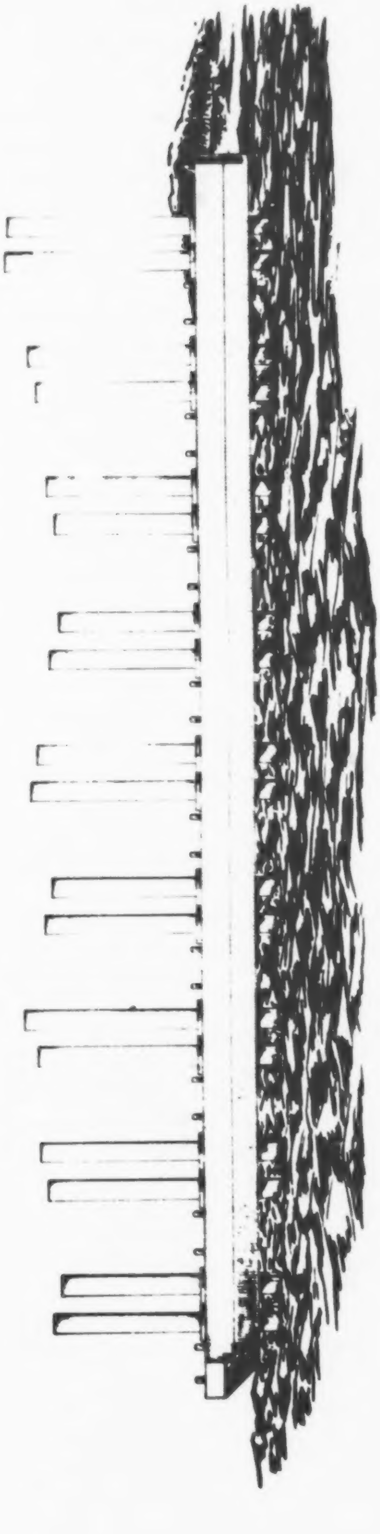

Figure 68. Typical storage method for self-elevating barges.

APPENDIX U
DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR TUG, OCEAN GOING, DIESEL, 1530-HORSEPOWER, STEEL, 143-FOOT, DESIGN 377A

1. General. This appendix provides detailed instructions for preparation of tug, design 377A, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and Stowage.*

(1) *Pilothouse.* The following items will be removed, identified and stowed in the pilothouse:

- *(a)* Pelorus stand.
- *(b)* Blinker light and key.
- *(c)* Rudder anchor directory.
- *(d)* Jackstaff and anchor light staff.
- *(e)* Ship's bell and bracket.
- *(f)* Windshield wipers.
- *(g)* Navigation lights.
- *(h)* Searchlights.
- *(i)* Halyards.
- *(j)* Horn, air whistle and lanyard.
- *(k)* Main deck fire station valves and fittings.
- *(l)* Skylight glass — blank wiht sheet metal.
- *(m)* Radar antenna.
- *(n)* Radio whip antenna.
- *(o)* Main radio cable antenna.

(2) *Crew Quarters.* The following items will be removed, identified, and stowed in the crew quarters:

- *(a)* All canvas covers, curtains and dodgers.
- *(b)* Lifeboat falls and equipment.
- *(c)* Scuttle and deckplate keys, and dog wrenches.
- *(d)* Fire monitors and valves.
- *(e)* Salvage hose.
- *(f)* Grating from aft and main deck.

(3) *Lifeboat.* The lifeboat and/or float-away life raft will be stowed on the boat deck. The lifeboat will be inverted and stowed on supports of sufficient height to hold the boat clear of the deck. The supports will be distributed to minimize stresses on the boat. The grips will be used to hold the lifeboat in position.

b. Methods of dynamic dehumidification. Outlined below are two methods of preparing the ocean going tug, design 377/377A, for dynamic dehumidification. Either method is acceptable.

(1) *Method A.* Method A utilizes a rotary desiccant electric dehumidifier, solid wheel type 20-153, 150,000 cubic foot capacity, 440-volt, three phase 60-cycle alternating-current and uses the fire main (as the carrier) for transferring the dry air throughout the vessel. This single machine will dehumidify the entire tug, including the windlass and towing motor. There are approximately 67,000 cubic feet of space within the tug to dehumidify.

(2) *Method B.* Method B utilizes a total of seven to eight package type dehumidifiers, single desiccant bed, 10,000 cubic feet capacity to dehumidify the tug. Under this method, the vessel is dehumidified by zones, consisting of specific areas of the vessel. Like Method A, all areas of the tug, including the anchor windlass and towing motor, are under dehumidification.

c. Preparation for dehumidification for Method A.

(1) *Dehumidified areas.* The entire interior of the tug will be prepared for dehumidification.

(2) *Provision for air circulation.* To permit maximum circulation of air within the dehumidified zone, all interior doors, including the door from the engineroom to the shaft alley, cabinet doors, controller doors, refrigeration doors, doors on similar items will be secured in open position. All manhole covers will be removed and secured in other than normal position.

NOTE

> Manhole covers and scuttles will be covered with 1½-inch perforated mesh wire to prevent injury during inspection.

The engine escape hatch and the hatch between the stores compartment and shaft alley will be secured in an open position. Valves in the bilge suction line from the tank, voids and compartments and the bilge manifold valves will be opened. Ventilation systems will be in an open position. Piping will be disconnected at the air storing tank and at the air valves. All air valves will be left in open position. The drain plugs and inspection plates will be removed from the exhaust manifold and secured adjacent to places of removal.

(3) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are as follows:

(a) Crew quarters scuttle. The scuttle to the crew quarters will be sealed by troweling bituminous coating into the aperture between the coaming and closed cover. The recess in the cover will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating.

(b) Tanks, vents, fills and discharges. All tank vents and fills and discharge openings located in deck will be sealed with strippable coating and bituminous coating.

(c) Fire monitors. The openings resulting from the removal of the fire monitors and valves will be blanked and sealed with strippable coating and bituminous coating.

(d) Stack. The louvered section and the openings at the top of the stack will be masked with pressure-sensitive tape and sealed with strippable coating and bituminous coating. The joint between the stack cover and the rim will be sealed with strippable coating. The exhaust stacks protruding from stack cover will be blanked and sealed with strippable coating and bituminous coating. The door in the stack will be sealed with strippable coating and bituminous coating. All other seams or openings in the stack which affect the air tightness will be sealed in a similar manner.

(e) Gooseneck and mushroom vents. Gooseneck and mushroom vents will be sealed with strippable coating and bituminous coating.

(f) Voice tubes. The mouthpiece covers on the voice tubes located in the emergency steering station will be sealed with strippable coating and bituminous coating.

(g) Fidley. The stagger welds and gasketed joints around the fidley will be sealed with strippable coating and bituminous coating.

(h) Exterior doors, windows and portlights. The edges of the exterior doors, pilot house, windows and portlights will be sealed with strippable coating and bituminous coating. When sealing the portlights, the strippable coating will be extended outward over the adjacent surfaces of the bulkheads. One exterior door will not be sealed; it will be marked "ACCESS DOOR FOR INSPECTION AND D.H. READINGS."

(i) Louvered openings. All louvered openings on the exterior of vessel will be covered with galvanized sheet metal or exterior plywood blanks. The blanks will be secured over the louvers. The perimeter of the blank and the door will be sealed with strippable coating and bituminous coating.

(j) Steering cable guide tube. The steering cable guide tube will be sealed at the stern end of the tube with strippable coating and bituminous coating. The seal will extend around the cable and the tube opening and will overlap both for a distance of 2 inches.

(k) Stern tube and cooling water connections. The cooling water pipe will be detached at the stern tube connection and the opening to the stern tube connection, and the opening to the stern tube closed with a plug or cap. The threads will be coated with pipe thread compound.

(l) Fire stations. The openings resulting from the removal of all fire station valves above the first flange exterior of vessel, except those fire valves necessary to supply dry air to the windlass and towing engineroom will be blanked with galvanized sheet metal or exterior grade plywood blanks.

(m) The fire and salvage line blanks will be sealed with strippable coating and bituminous coating.

(n) Engine order telegraph. The engine order telegraph on the lifeboat deck will be sealed with strippable coating and bituminous coating. The junction of the pedestal and deck will be similarly sealed.

(o) Windlass cover. A cover will be fabricated and installed over the anchor windlass, blanked hawse pipe openings, and the forepeak access. The cover will be fabricated from minimum No. 18 gage galvanized sheet metal. All top and verticle edges will be reinforced by 1-x1-x1/8-inch angle irons. A coaming of 1-x1-x1/8-inch angle iron will be tack welded to the deck around the windlass. The angle irons will be positioned with one face toward the deck and the vertical face toward the windlass. The size and shape of the coaming will be such that the sheet metal fits snugly over the verticle faces. The cover will be fastened to the coaming by No. 12 sheet metal screws spaced approximately 2 feet apart. Apertures between the coaming and the deck will be filled with bituminous coating. All joints and seams will be covered with strippable coating and bituminous coating.

(p) Dehumidification piping system. The connecting points of air ducts to areas being dehumidified will be sealed with strippable coating and bituminous coating. The sealing will be carried over and around the flanges and

adapters and other devices used to attach or introduce the ducts. All joints and seams in the duct will be similarly sealed.

(q) *Miscellaneous sealing.* Window drain holes and openings resulting from removal of windshield wipers, horn, searchlights, and other items will be sealed with strippable coating. All other exterior openings that lead to dehumidified zones and not specified herein will be sealed with strippable coating and bituminous coating.

(r) *Towing engine.* The rear door to the towing engineroom will be blanked with galvanized sheet metal. The perimeter of the blank will be sealed with strippable coating and bituminous coating.

(4) *Dehumidification installation.*

(a) Dehumidification machine. A rotary desiccant electric dehumidifier, solid desiccant wheel type 20-153, 150-000 cubic foot capacity, 440-volt, three-phase, 60-cycle, alternating-current will be installed generally as shown in figure 69. (BUSHIPS Dwg No. ATAS380340 A223ALT). The machine will be mounted on a weather deck for ease of servicing and will be fitted with a cover to protect it from the weather.

(b) *Duct installation.* The vessel's fire main will be used as the supply source for dry air, as illustrated in figure 69. Six-inch flexible duct will be used within the vessel to supply dry air to those areas remote from the fire main, (see fig. 69 for details).

(c) *Machine connections.* Connections of ducts to the dehumidification machine will be made of unions or slip joint connections which permit easy removal of the machine for servicing.

(d) *Ductwork supports.* Flexible ductwork within the D/H zone, servicing the remote areas, may be supported by wire or rope or any suitable means. Ductwork run on the deck will be supported on metal or wood stanchions. The duct will be secured to the stanchion with galvanized steel strapping.

(e) *Humidistat.* The humidistat will be set to maintain a 40-percent relative humidity plus or minus 5 percent, within the dehumidified zones. The humidistat(s) will be placed about 3 to 5 feet above the bottom deck plate near the air return path to the D/H machine (see fig. 69 for location of humidistat(s)).

(f) *Air tightness test.* The air test outlined in chapter 6 of this bulletin will be performed to assure vessel is tight and economical operation of D/H machine. Air leaks can be detected by its noise or by means of smoke bomb, soap and water, or fine powder such as flour. Test will be conducted prior to drydown period.

(5) *Surveillance.*

(a) *Drydown period.* During the initial drydown period, the dehumidifier should be adjusted to the manufacturer's Specifications for maximum effeciency in that period. The maximum effeciency in that period. The distribution of dehumidified air in the D/H system the required percentage of air in various D/H outlets is set by feeling the flow of the air by hand. A good sense of judgement is needed in this requirement. However, psychrometer readings will be taken at sensing stations. Sensing stations should include at least four stations: One—furthest point forward; two—furthest point aft; three—lowest point of vessel; four—top side cabin space. Psychrometer readings will be taken at these sensing stations in the vital air return paths to show difference in relative humidity. Inspections will be made to assure that no unnecessary obstacles are in the air return paths. The D/H outlets are adjusted to increase or decrease air flow with the recorded relative humidity. If the readings in the D/H zone should differ less than 40 percent, plus or minus 5 percent, or read lower than the prescribed RH, the air flow in that area will be decreased. Conversely, if the reading is higher than the prescribed RH, the air flow in that area will be increased.

(b) *Normal D/H period.* After the initial drydown period had been attained (*approximately 3 or 4 weeks), the residual moisture in the air and in the material aboard the vessel are in a balancing state. The moisture load is reduced as indicated by the lapsed running time of the indicators on the humidifiers. Quarterly inspections will be made within the vessel from four predetermined stations fore, aft, engineroom, and above deck cabins and quarters. Relative humidity readings will be recorded at each station. If variance from the prescribed RH 40 percent, plus or minus 5 percent, is noted between stations, air flow adjustments will be made as previously described to obtain proper air flow balance.

(6) *Wiring.* D/H machine wiring will conform to the manufacturer's handbook or brochure. NAVSHIPS TECHNICAL MANUAL 0938-039-8010 titled "Operation Maintenance and Repair Instructions for Rotary Type Desiccant Dehumidifier", dated 27 March 1970, is available

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* NOTE: This is the minimum period of time. In some instances, the drydown period could last substantially longer based on the amount of moisture in the air and the materials aboard the vessel.

through the Navy Publications Center, Philadelphia, Pennsylvania. They can be obtained through normal publications requisitioning procedures.

d. Preparation for dynamic dehumidification for Method B.

(1) *Dehumidified area.* The entire interior of the tug, including the anchor windlass and towing motor room, will be prepared for dynamic dehumidification. The vessel will be divided into zones, and each zone dehumidified individually.

(2) *Establishment of zones.* The number of zones and the arrangement of zones will be based on the following criteria:

(a) Availability of ingress thru top side openings into the cabin and quarters area and main deck openings into the interior of vessel without cutting openings into bulkhead or main deck.

(b) Arrangement of zones that will provide maximum air circulation with the minimum of ductwork, which will deliver dry air to essential compartments of vessel within the D/H zone.

(c) Air path to duct should be direct and short. This reduces ductwork and friction loss and saves time, labor, and material at time of deprocessing and activation.

(3) *Provisions for air circulation.* Within the boundary of each zone being dehumidified, all interior doors, hatch and scuttle covers, manhole covers, and handhole covers will be secured in the open position. Galley ranges, refrigerator doors, cabinet doors, and similar items will be left open. Enclosed switchboard's distribution panels and other electrical assemblies will be secured in open position and exposed to dry air. All dampers in the ventilation system will be turned to the open position. All tanks located in zones being dehumidified will be opened for circulation of air by removal of covers and drain plugs. Drain cocks, where present, will be opened.

(4) *Sealing for dehumidification.* Methods and materials used in sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements will be the same as that specified for Method A, with the following exceptions:

(a) All doors, vents, windows and portlights, except those used for introduction of dry-air and moist-air return ducts, humidistat cables and sensing elements will be sealed with strippable boating and bituminous coating.

(b) The access door, designated for inspection purposes under Method A, will be sealed as specified for other exterior doors. Sensing elements will be installed in the dehumidified area(s) for inspection purposes.

(5) *Dynamic dehumidification installation.* A minimum of eight package dehumidifiers, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current will be installed. The machine, with covers and stands fabricated as shown in this bulletin, will be located on the outside of the tug, adjacent to the zone which they service. The machines will be positioned to require the minimum of ductwork.

(6) *Duct Installation.* Four-inch-diameter, No 26 gage, galvanized tubing, with necessary ells, tees, reducing fittings and connections, will be installed as required. Ductwork, when necessary, will be supported on 2-x4-inch wood or metal stanchions. The ductwork will be secured to the stanchions with galvanized strapping. Flexible ductwork used within the dehumidified zones will be supported by wire, rope, or other suitable means.

(7) *Humidistats.* The operation of each dehumidifier will be controlled by a humidistat set to maintain a relative humidity of 40 percent, plus or minus 5 percent, within the dehumidified zone. Humidistats will be installed for each machine. Humidistats will be installed within the dehumidified area, approximately three feet above the deck. They will be located well away from the incoming dry air. Locate humidistats near the return air supply to the dehumidifier. Wiring will be in accordance with wiring diagrams furnished with the instrument.

(8) *Sensing elements.* Humidity sensing elements of an approved type will be installed in the dehumidified area for inspection purposes. The number of elements used will be limited to the number required for a reasonable check on vapor diffusion within the dehumidified zones. Sensing elements will be located near the points from which the moist air is withdrawn. In no case will they be in the path of incoming air.

(9) *Machine connections.* In zones where two or more dehumidification machines are used, they specified. Where multiple machine use is required, and space is limited, they may be stacked, as shown in figure 71, and connected with the necessary elbows and tees as required. Connection of the ducts to the dehumidification machine will be made with union or slip joint connections to permit easy removal of machines for servicing.

(10) *Air tightness test.* The air test outlined in chapter 5 of this bulletin will be performed to

assure economical operation of machines and that vessel is reasonably water and air tight.

(11) *Wiring*. All wiring of dehumidification machines and humidistats will be in accordance with the manufacturer's instructions.

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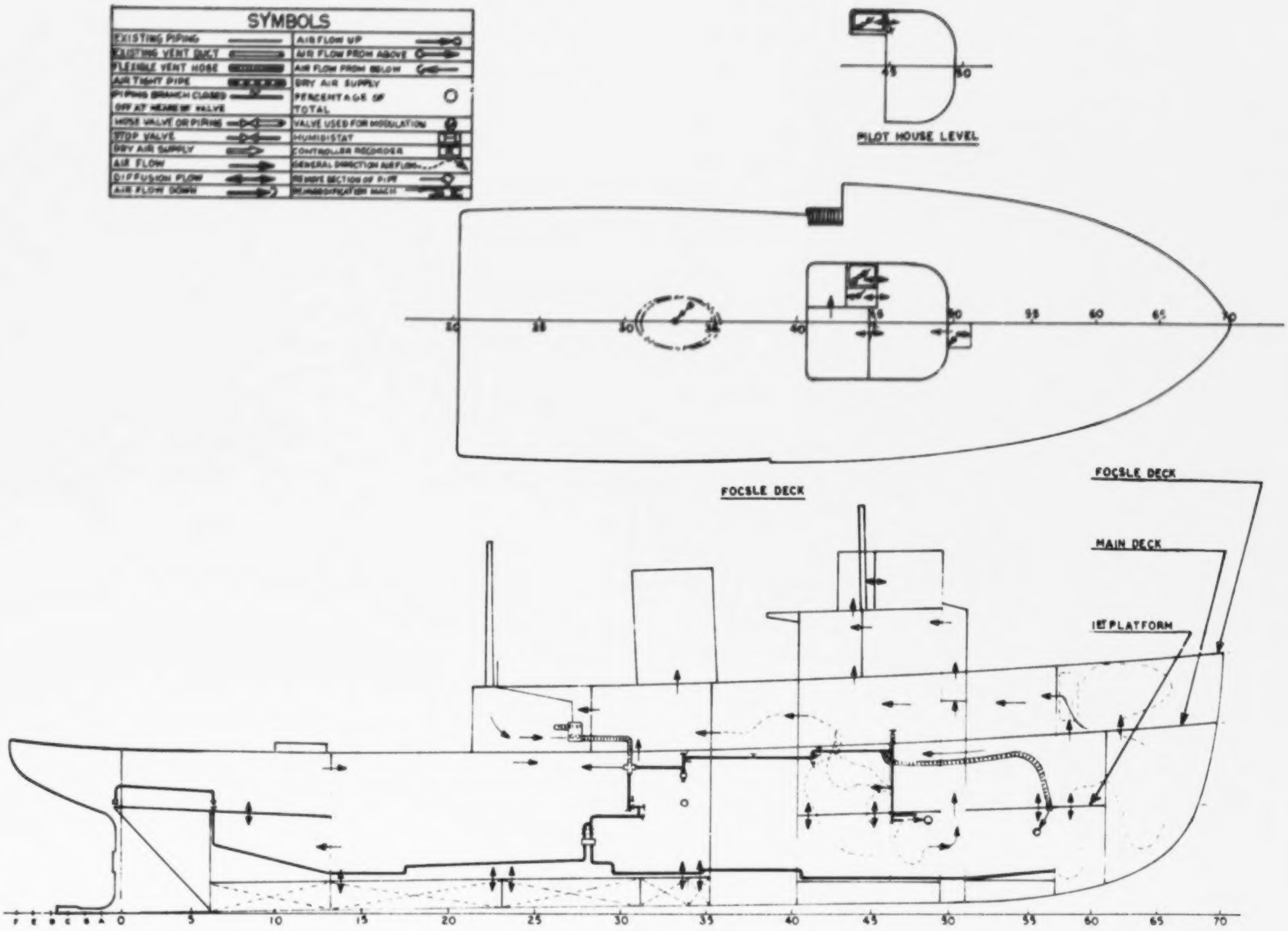

Figure 69. Dehumidification system for tug design 377 using the vessel's fire main (sheet 1 of 2).

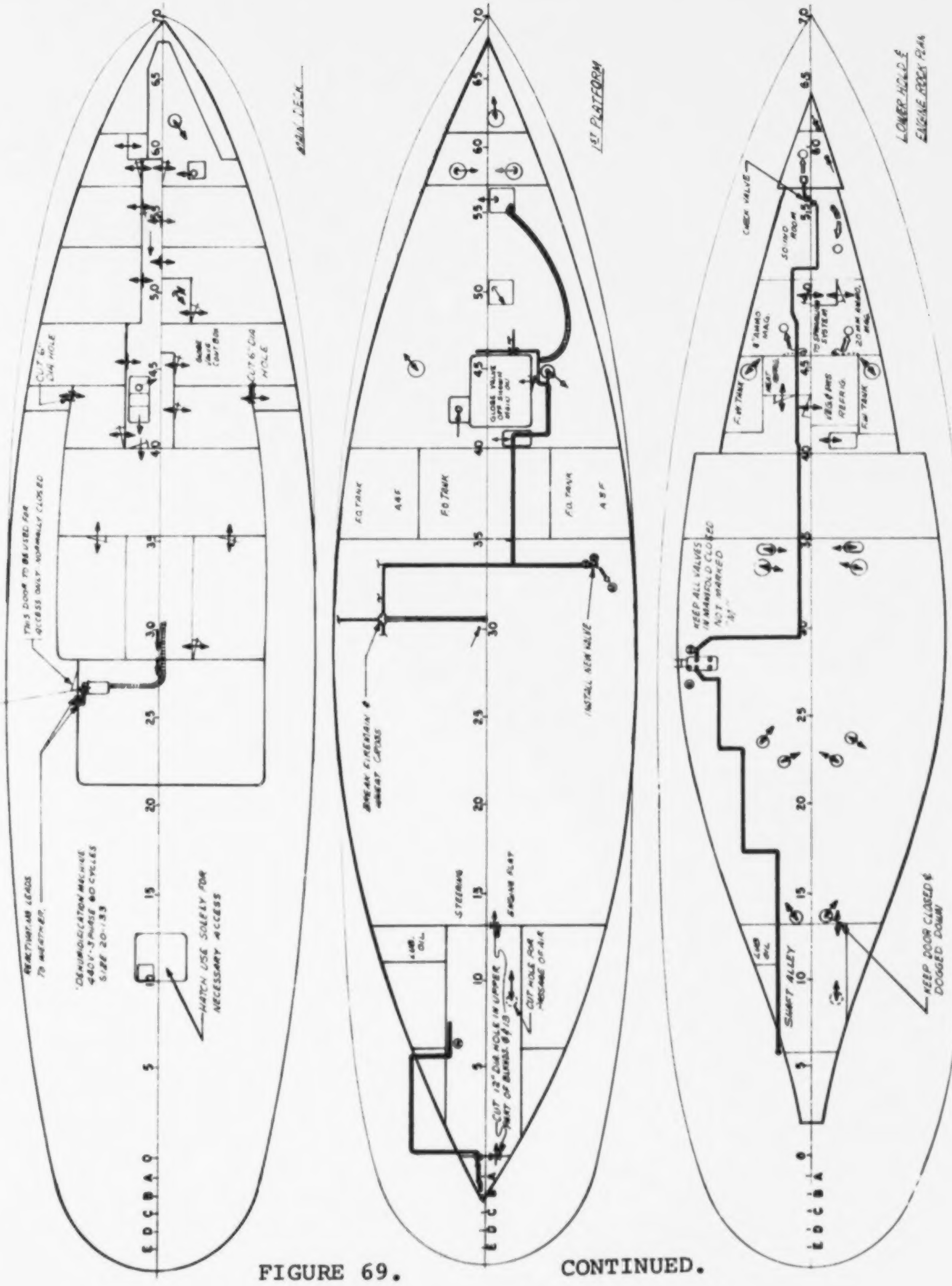
MAIN DECK
1ST PLATFORM
LOWER HOLD & ENGINE ROOM PLAN
THIS DOOR TO BE USED FOR ACCESS ONLY NORMALLY CLOSED
CUT 6" DIA HOLE
CUT 6" DIA HOLE
VENTILATION LEADS TO WEATHER
DEHUMIDIFICATION MACHINE 440V-3 PHASE 60 CYCLES SIZE 20-133
HATCH USE SOLELY FOR NECESSARY ACCESS
F.O. TANK
F.O. TANK
F.O. TANK
GLOBE VALVE OFF SUCTION MAIN
BREAK FIREMAIN & INSERT CROSS
INSTALL NEW VALVE
STEERING
ENGINE FLAT
LUB. OIL
CUT 12" DIA HOLE IN UPPER PART OF BLKHDS 8 & 13
CUT HOLE FOR PASSAGE OF AIR
CHECK VALVE
SOUND ROOM
8" AMMO MAG.
TO SPRINKLING SYSTEM
20 MM AMMO MAG.
F.W. TANK
F.W. TANK
VEG & DRY REFRIG.
KEEP ALL VALVES IN MANIFOLD CLOSED NOT MARKED "M"
SHAFT ALLEY
LUB OIL
KEEP DOOR CLOSED & DOGGED DOWN
E D C B A 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70

Figure 69. Dehumidification system for tug design 377, using the vessel's fire main (sheet 2 of 2).

FIGURE 69. CONTINUED.

General Notes Applicable to Figure 69.

GENERAL NOTE

Variations in the arrangement of the fire main system for the various vessels can be disregarded as long as the desired dry-air distribution can be effected and all branches not used for dry-air distribution are shut off.

GENERAL INACTIVATION NOTES

1. Prior to installation of equipment and arrangement of services, as indicated on this plan, the vessel shall be prepared in accordance with TB 740-97-4, air and water tightness.
2. All dampers, doors, hatches, valves, and other closures not shown, shall be closed. Those shown shall be closed unless otherwise indicated. Valves shown, but not used for control of dry-air flow, shall be left eased off from wide open position.
3. Valves in the fire main and connected services used for control of dry-air flow shall be tagged "keep closed", "keep open" or "use for control", as required.
4. Where existing vessels structure or services deviate from this drawing, air flow shall be modified to suit the intent of this plan.
5. All valves, fittings, etc., to be removed shall be tagged for proper replacement.
6. All gaskets required for reassembly of valves, fittings, etc., shall be supplied and attached to item removed.
7. Where it is necessary to cut openings in structures such as holes in bulkheads or decks for passage of dehumidification air, provision shall be made for readily closing such openings upon return of vessel to active status, i.e., plating of suitable dimensions, with arrangements for ready installation, properly identified, and secured nearby for rapid replacement.
8. Each dry-air outlet shall be controlled by nearest valve, as indicated, to obtain proper volume of dry air.
9. Dehumidification machine and humidistat will be obtained through regular requisitioning supply system.
10. Flexible hose shown shall conform to MIL-H-8796, 4¾" O.D. standard catalog. Unless otherwise indicated, connections shall be by "bag" fittings or other suitable connections.
11. Preservation of oil and gasoline tanks shall be in accordance with TB 740-97-4.
12. Shore Service Requirements:

Electrical	MAX Rate	
Dehumidification Machine	440V. AC	3 KW
Lights and Testing	120V. AC	19 KW

Vessels service power and lighting switchboard shall be energized through shore connections box. All circuit breakers on the switchboard shall be opened except those feeding power and lighting service.

13. Dehumidifier, size 20-153, and humidistat(s) will be used for this plan.
14. Dehumidified volume of vessel—66,000 cu. ft.
15. Plan applicable to Tug-ATA/377.

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APPENDIX V

DYNAMIC DEHUMIDIFICATION INSTRUCTIONS FOR VESSEL, LIQUID CARGO, 182-FOOT DESIGNS 294 AND 294AB

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1. General. This appendix provides detailed instructions for preparation of vessel, liquid cargo, designs 294 and 294AB, for dynamic dehumidification.

2. Preparation Instructions. *a. Disassembly and stowage.*

(1) *Pilothouse.* The following items will be removed, identified, and stowed in the pilothouse:

(a) Searchlights.
(b) Signal lights.
(c) Running lights—including towing, range, anchor, and breakdown.
(d) Binnacle and stand.
(e) Windshield wipers and motors.
(f) Halyards.

(2) *Crew quarters.* The following items will be removed, identified, and stowed in the crew quarters:

(a) Bunks.
(b) Lockers.
(c) Radar Antennas.

(3) *Forecastle Deck Storage Locker.* The following items will be removed and stowed in the forecastle locker:

(a) Door dogs.
(b) Deck keys.
(c) Canvas.
(d) Canvas covers.
(e) Fire monitors and valves.
(f) Port hole screens.
(g) Lifeboat blocks and falls.
(h) Fire hose.
(i) Cargo boom rigging.

(4) *Dry Cargo Hold.* The following items will be removed and stowed in the dry cargo hold:

(a) Oars.
(b) Boat hooks.
(c) Cargo davits.
(d) Cowling vents.
(e) Life floats.

(5) *Lifeboats.* The lifeboats and float-away rafts will be stowed on the boat deck. The lifeboats will be inverted and stowed in supports of sufficient height to hold the boat clear of the deck. The supports will be distributed to minimize stresses on the boat. The grips will be used to hold the lifeboat in place.

b. Methods of dynamic dehumidification. Outlined below are two methods of preparing the liquid cargo vessel for dynamic dehumidification. Either method is acceptable.

(1) *Method A.* Method A utilizes a rotary electric dehumidifier, 150,000 cubic foot capacity, and uses the fire main as the carrier for transferring the dry air throughout the vessel. This single machine will dehumidify the entire vessel *except the liquid cargo tanks and dry cargo hold.*

(2) *Method B.* Method B utilizes a minimum of eight package dehumidifiers, single desiccant bed, 10,000 cubic foot capacity, to dehumidify the vessel. Under this method, the vessel is dehumidified by zones consisting of specific areas of the vessel. Like Method A, all areas of the vessel, *except the liquid cargo tanks and the dry cargo hold,* are under dehumidification.

c. Preparation for dynamic dehumidification for Method A.

(1) *Dehumidified area.* The entire interior of the vessel, except the liquid cargo tanks, dry cargo hold, and coffer dam will be prepared for dynamic dehumidification.

(2) *Provisions for air circulation.* To permit maximum circulation of air within the dehumidified zone, the escape hatch from the engineroom, passageways to the main deck will be left open. All doors, to the officers' mess, crew's mess, meat and vegetable lockers, mate's and crew's lavatory, and seaman's and gunner's quarters will be secured in an open position. Passageway to the top deck will be left open. All doors leading into the radio chart room, pilot house, sick bay, captain's, chief engineer's, and radio operator's room will be secured in an open position. The ammunition storage paint and lamp locker, windlass and forepeak castle will be placed under dynamic dehumidification.

(3) *Sealing for dehumidification.* Methods and materials used for sealing for

dehumidification will be in accordance with this bulletin. Detailed sealing requirements are as follows: All exterior doors, *except the one-designated for entry for inspection and RH readings*, will be stripped with pressure-sensitive tape and sealed with bituminous coating and strippable coating. All scuttles, exterior hatches, vents, louvers, stern tube coupling water connections will be sealed with bituminous coating and strippable coating. The louvered sections and the openings at the top of the stack will be masked with pressure-sensitive tape and sealed with bituminous coating and strippable coating. The exhaust stack protruding from the stack will be blanked and sealed with strippable coating and bituminous coating. Gooseneck and mushroom vents will be removed, the openings blanked with plywood or galvanized metal, and the perimeter sealed with bituminous coating and strippable coating. Seal all openings, resulting from the removal of windshield wiper motors, horn, searchlights, and other such items, with bituminous coating and strippable coating.

(4) *Miscellaneous sealing.* All openings that lead to dehumidified zones not specifically covered herein that would permit the entry of water or moisture will be sealed and made watertight, as specified, with strippable coating and bituminous coating.

(5) *Windlass cover.* A cover will be fabricated and installed over the anchor windlass and blanked hawse pipe openings. The cover will be fabricated from minimum No. 18 gage galvanized sheet metal. All top and vertical edges will be reinforced by 1-x1-x1/8-inch-angle iron tack welded to the deck around the windlass. The angle irons will be positioned with one face toward the deck and the vertical face toward the windlass. The size and shape of the coaming will be such that the sheet metal fits snugly over the vertical faces. The cover will be fastened to the coaming by No. 12 sheet metal screws spaced approximately 2 feet apart. Apertures between the coaming and the deck will be filled with bituminous coating. All joints and seams will be sealed with strippable coating and bituminous coating. If no openings exists, i.e., manhole or hatch, to permit circulation of dry air to the windlass, ingress will be made as indicated in the inclosed BUSHIPS drawing.

(6) *Dehumidification installation.*

(a) *Dehumidification machine.* A rotary desiccant, electrical dehumidifier, solid (wheel) type 20-153, 150,000 cubic foot capacity, 440-volt, three-phase, 60-cycle, alternating-current, will be installed, generally, as shown in figure 70. (BUSHIPS Dwg Y0113-S3803-B929 49 ALT. 3). The machine will be mounted outside the dehumidified zone on the weather deck to permit ease of servicing. The machine will be fitted with a cover to protect it from the weather.

(b) *Duct installation.* The vessel's fire main will be used as the source for the dry-air supply to the dehumidified zones, as shown in the inclosed drawing, figure 70, and as specified herein.

1. Where the fire main terminates at the bulkhead of the forecastle, an elbow and pipe of the same dimensions will be added to the fire main valves and carried through into the bulkhead, into the forecastle lockers, to the port side of the resistor bank.

2. Ingress into the bulkhead will be large enough to accomodate both the dry-air supply and the moist-air return line back to the dehumidification machine. The union of the freshwater line supplying the forepeak tank on the port side inside the forecastle locker will be disconnected, and the cover removed to permit entry of flexible hose to service the area (forepeak tank) below the forecastle deck locker. The chain locker manhole covers will be opened to permit circulation of dry air to the chain locker.

3. The manhole cover in the pumphouse will be removed and fire main beneath the pumphouse void will be disconnected to permit circulation of dry air into the pump room.

4. A flexibile hose will be used for the moist-air pickup and return to the dehumidification machine. The portlight in the hatchway will be removed and fitted with a plywood or sheet metal blank to permit ingress of moist-air return line from dehumidification machine into the pumproom.

5. All unions and joints in the engineroom fire main will be disconnected and fitted with tees and/or valves to permit circulation of dry air to the engineroom and machinery casing.

6. The fire main valve in the aft reefer section (main deck) will be left open to permit circulation of dry air to main deck cabins and pilot house. The voice tubes will be left open from bridge to lower cabin areas to permit circulation of dry air.

7. A flexible hose for moist-air pickup will be installed at the lowest point in the engineroom and will extend back to the return air connection at the dehumidification machine located in the weather deck. The fire valve on the aft end of the boat will be closed or capped.

Figure 70. Dehumidification system for Y-tanker design 294.

(Located in back of manual)

(c) Machine connections. Connections of ducts to dehumidification machine will be made with unions or slip joints connections to permit easy removal of machine for servicing.

(d) Ductwork supports. Flexible ductwork used within the D/H zones will be supported by wire, rope or other suitable means. Ductwork on deck will be supported on metal or wood stanchions. The duct will be secured to the stanchions by galvanized steel strapping.

(e) Humidistat. The humidistat will be set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified zones. The humidistat will be located about 5 feet above the deck near the return air supply to the dehumidification machine.

(f) Air tightness test. The air test outlined in this bulletin, will be performed to assure economical operation of the D/H machine. Air leaks can be detected by its noise or by means of smoke bomb, soap and water, or fine powder such as flour.

(g) Surveillance.

1. Drying Period. During the initial drydown period, the dehumidifier should be adjusted to the manufacturer's specifications for maximum efficiency in that period. The distribution of D/H air in the D/H supply system is adjusted in this period. For the first estimate, the required percentage of air in various D/H outlets are set by feeling the flow of the air by hand. A good sense of judgement is needed in this requirement. However, sling psychrometer readings will be taken at sensing stations in the vital air return paths. The D/H outlets are adjusted to increase or decrease air flow with the recorded relative humidity. If the readings in the zone should differ less than 40, plus or minus 5 percent, or read lower than the R/H prescribed, the air flow in that area outlet should be decreased. If the reading is higher than that prescribed, the air flow to that area should be increased.

2. Normal D/H period. After the initial drydown period has been attained (approximately 3 or 4 weeks*), the residual moisture in the air and in materials aboard the vessel are in balancing state. The moisture load is reduced as indicated by the lapsed running time indicators on the humidifier. Quarterly inspections will be made within the vessel from four predetermined stations; fore, aft, engineroom, and above deck quarters and cabins. Relative humidity readings will be recorded at each station. If variance from the prescribed R/H 40, plus or minus 5 percent, is noted between stations, air flow adjustments, as previously described, will be made to achieve proper air flow balance.

d. Preparation for dynamic dehumidification for Method B.

(1) *Dehumidified Area.* The entire interior of the vessel, *except the liquid cargo tanks and dry cargo hold*, will be prepared for dynamic dehumidification. The vessel will be divided into four zones and each zone dehumidified individually.

(a) Zone 1. The anchor windlass on main deck of forecastle.

(b) Zone 2. Ammunition, paint and lamp, and chain locker and forepeak tank.

(c) Zone 3. Pump room on main deck of vessel.

(d) Zone 4. Engineroom, crew's quarters, pilot house, radio and chart room, sanitary facilities, passageways, and all other areas to which there is access from one or more of the above mentioned areas will be included in zone 4.

(2) *Provisions for air circulation.* Within each zone being dehumidified, all interior doors, hatch and scuttle covers, manhole covers, and handhole covers will be secured in the open position, or removed and secured as applicable. Galley range and refrigerator doors will be secured in open position. Enclosed switchboards, distribution panels, and other electrical assemblies will be secured open and exposed to the air. All dampers in ventilation system will be turned to open position. All tanks located in areas being dehumidified will be opened for circulation of air by removal of covers and drain plugs. Drain cocks, where present, will be opened. Covers and plugs will be tagged and secured adjacent to their places of use. The escape hatch from the engineroom and passageways to the main deck will be left open. all doors to the officer's mess, crew's mess, meat and vegetable lockers, mate's and crew's lavatory, and seaman's and gunner's quarters will be secured in an open position.

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*This is the minimum period of time. In some instances, the drydown period could last from two to three months, based on the amount of moisture in the air and the materials aboard the vessel.

Passageway to the top deck will be left open. All doors leading into the radio chart room, pilothouse, sick bay, captain's, chief engineer's, and radio operator's room will be secured in an open position.

(3) *Sealing for dehumidification.* Methods and materials used for sealing for dehumidification will be in accordance with this bulletin. Detailed sealing requirements are as follows: All exterior doors, will be stripped with pressure-sensitive tape and sealed with bituminous coating and strippable coating. All scuttles, exterior hatches, vents, louvers, stern tube coupling water connections will be sealed with bituminous coating and strippable coating. The louvered sections and the openings at the top of the stack will be masked with pressure-sensitive tape and sealed with bituminous coating and strippable coating. The exhaust stack protruding from the stack will be blanked and sealed with strippable coating and bituminous coating. Gooseneck and mushroom vents will be removed, the opening blanked with exterior grade plywood for galvanized metal, and the perimeter sealed with bituminous coating and strippable coating. Seal all openings, resulting from the removal of windshield wiper motors, horn, searchlights, and other such items, with bituminous coating and strippable coating.

(4) *Miscellaneous sealing.* All openings that lead to dehumidified zones not specifically covered herein that would permit the entry of water or moisture will be sealed and made watertight with strippable coating and bituminous coating.

(5) *Windlass cover.* A cover will be fabricated and installed over the anchor windlass, and blanked hawse pipe openings. The cover will be fabricated from minimum No. 18 gage galvanized sheet metal. All top and vertical edges will be reinforced by 1-x 1-x 1/8-inch-angle iron tack welded to the deck around the windlass. The angle irons will be positioned with one face toward the deck and the vertical face toward the windlass. The size and shape of the coaming will be such that the sheet metal fits snugly over the vertical faces. The cover will be fastened to the coaming by No. 12 sheet metal screws spaced approximately 2 feet apart. Apertures between the coaming and the deck will be filled with bituminous coating. All joints and seams will be sealed with strippable coating and bituminous coating. Openings for the air ducts and sensing element will be provided.

(6) ***Dynamic dehumidification installation.***

(a) Dehumidification machines. Eight package dehumidifiers, single desiccant bed, absorbent type, 10,000 cubic foot capacity, 110-volt, alternating-current, will be installed. The machines, with covers and stands fabricated as shown in this bulletin will be located in the zones indicated below:

1. Zone 1. One package dehumidifier will be located just outside the dehumidified zone on the main deck of the forecastle.

2. Zone 2. Two package dehumidifiers will be located on the main deck, starboard side, directly in front of forecastle hatch. (See fig. 1 for multiple D/H systems).

3. Zone 3. One package dehumidifier will be located on main deck, starboard side, directly in front of pump room hatch.

4. Zone 4. Four package dehumidifiers will be located on the blower compartments on the boat deck close to the skylights. Two dehumidifiers will be mounted on the port side and two on the starboard side. (See fig. 1 for wiring diagram for multiple D/H systems).

(b) Duct Installation. Four-inch-diameter, No. 26 gage, galvanized tubing, with necessary ells, tees, reduced fittings and connections, will be installed as required. Ductwork, when necessary, will be supported on 2-x4-inch wood stanchions. The ducts will be fastened to the stanchions with galvanized strapping. Flexible ductwork, used within the dehumidified zones, will be supported by wire, rope, or other suitable means.

1. Ducts to Zone 1. To permit the introduction of air ducts to the interior of the zone, openings have been provided in the windlass cover. The dry-air lines will be introduced through the top opening of the windlass cover, and the moist-air return line will be attached to the bottom opening of the cover.

2. Ducts to Zone 2. To permit introduction of air ducts to the interior of zone 2, the hatch on the starboard side of the forecastle will be removed and stowed in the ammunition storage locker. The hatch opening will be covered with a blank constructed of No. 18 gage galvanized sheet metal with flanged holes for attaching the air ducts. The blanks will be secured to the bulkhead with clips riveted to the blank, by tack welding to the corners, or by other suitable means. The dry-air lines will be introduced through the top openings of the blank, and the moist-air return lines will be attached to the bottom opening of the blank. Flexible tubing will be attached to the dry-air inlet and run to the forepeak tank.

3. Ducts to zone 3. To permit introduction of air ducts to the interior of zone 3, the hatch on the starboard side of the pump room will be removed and stowed in the pump room. The hatch opening will be covered with a blank constructed of No. 18 gage galvanized sheet metal with flanged holes for attaching the air ducts. The blanks will be secured to the bulkhead with clips riveted to the blank, by tack welding at the corners, or by other suitable means. The dry-air lines will be introduced through the top opening in the blank, and the moist-air return line will be attached to the bottom opening in the blank.

4. Ducts to Zone 4. To permit introduction of air ducts to the interior of zone 4, the skylights will be removed and stored in the pilothouse. The skylight opening will be covered with a blank constructed of No. 18 gage galvanized sheet metal with four flanged openings (2 on starboard side and 2 on port side) for attaching the air ducts. The blanks will be secured to the bulkhead with clips riveted to the blank, by tack welding at corners, or by other suitable means. Attach dry-air and moist-air return lines to the openings in the blank. Attach flexible tubing to the two dry air lines, and run one line forward of engine room and one line aft of engine room.

(c) *Humidistats.* The operation of each dehumidification machine will be controlled by a humidistat set to maintain a 40-percent relative humidity, plus or minus 5 percent, within the dehumidified zones. Humidistats will be installed for each machine. Humidistats will be installed within the dehumidified area, approximately three feet above the compartment deck. They will be located well away from the incoming dry air. Locate humidistats near the return air supply to the dehumidification machine. Wiring will be attached in accordance with wiring diagram furnished with the instruments.

(d) *Sensing elements.* Humidity sensing elements of an approved type will be installed in the dehumidified area for inspection purposes. The number of elements used will be limited to the number required for a reasonable check on vapor diffusion within the zones. Sensing elements will be located near the points from which moist air is withdrawn. In no case will they be in the path of incoming air.

(e) *Machine connections.* In zones where two or more machines are used, they may be connected in multiples of two or more. This can be accomplished by stacking the machines and connecting them together by use of piping, elbows, and tees as required (see fig. 71). Connection of the ducts to the dehumidification machines will be made with unions or slip joint connections to permit easy removal of machines for servicing.

(f) *Air tightness test.* The air test outlined in this bulletin will be performed to assure economical operation of the D/H machine. Air leaks can be detected by its noise or by means of smoke bomb, soap and water, or fine powder such as flour.

3. Liquid Cargo Tanks. Liquid cargo tanks will be coated with preservative oil conforming to MIL-L-21260, type I or II, grade 30.

4. Venting of Cargo Tanks. Manhole access covers of liquid cargo tanks will be removed and stowed in the dry cargo hold. Vents fabricated from No. 18 sheet metal will be placed over the manhole access holes. The vents shall be fabricated in two parts. One part will be a metal coaming with at least four openings of equal distance, fitted with wire mesh to permit breathing. The top of the coaming will be fitted with a cap. The cap will be a cone type or have a taper to allow water runoff. The cap will be fabricated to permit ease of removal for inspection of cargo tanks without disturbing the coaming. The cap may be a snug fitting slip type, or it may be fastened to the coaming with sheet metal screws. The aperture between the coaming and the manhole cover opening will be filled with bituminous coating and strippable compound to effect a watertight seal.

5. Venting of Dry Cargo Hold. Dry cargo hold will be vented to prevent condensation within the hold. Ventilator cowls will be installed over dry cargo hold hatches. The ventilators will be installed in a manner that will prevent the entry of water.

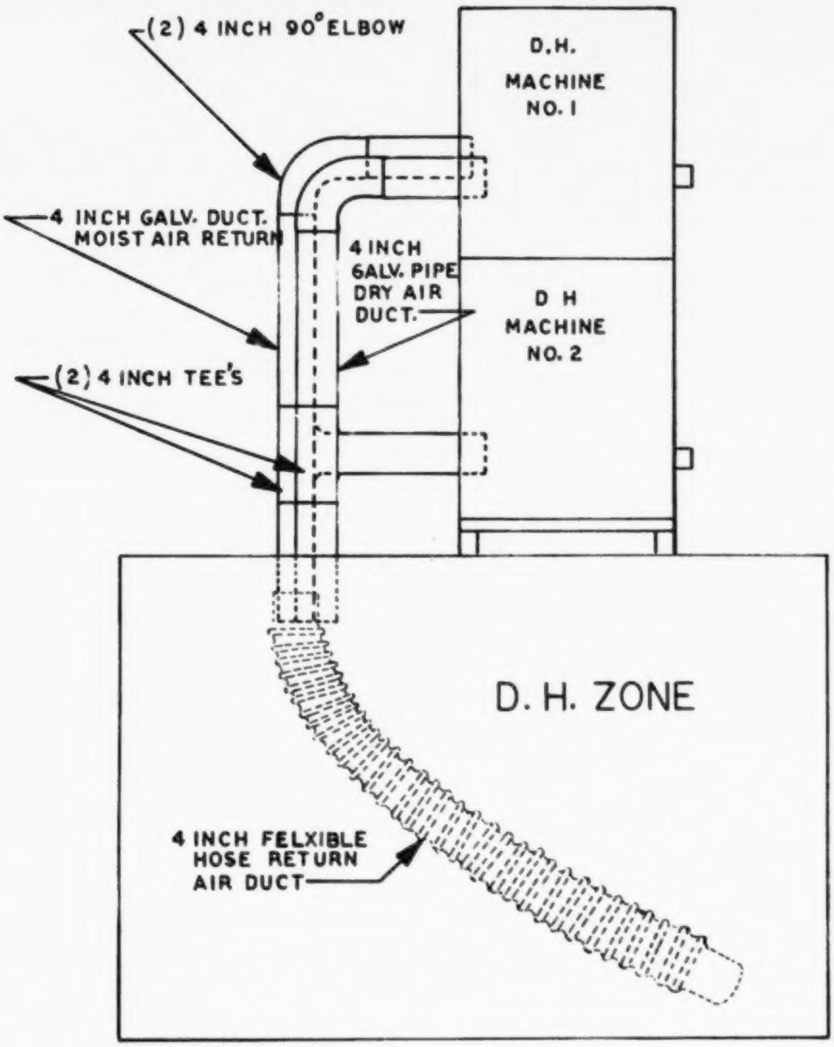
(2) 4 INCH 90° ELBOW
D.H. MACHINE NO. 1
4 INCH GALV. DUCT. MOIST AIR RETURN
4 INCH GALV. PIPE DRY AIR DUCT.
D H MACHINE NO. 2
(2) 4 INCH TEE'S
D. H. ZONE
4 INCH FELXIBLE HOSE RETURN AIR DUCT

Figure 71. Multiple D/H machine hook-up—stacked configuration.

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With dynamic dehumidification (w/o cocoon)	64	4-10
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With dynamic dehumidification (w/o cocoon)	84	4-16
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By Order of the Secretary of the Army:

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ARNG & USAR: None.

For explanation of abbreviations used, see AR 310-50.

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General Notes Applicable to Figure 70.

GENERAL NOTE

Variations in the arrangement of the fire main system for various vessels can be disregarded as long as the desired dry-air distribution can be effected, and all branches not used for dry-air distribution are shut off.

GENERAL INACTIVATION NOTES

1. Prior to installation of equipment and arrangements of services, as indicated on this plan, the vessel shall be prepared in accordance with TB 740-97-4, air and water tightness.
2. All dampers, doors, hatches, valves, and other closures not shown, shall be closed. Those shown shall be open unless otherwise indicated. Valves shown, but not used for dry air control, shall be left eased off from wide open position.
3. Valves in fire main and connected services used for control of dry air flow, shall be tagged "keep closed", "keep open" or "use for control," as required.
4. Where existing vessels structure or services deviate from this drawing, air flow shall be modified to suit the intent of this plan.
5. All valves, fittings, etc., to be removed shall be tagged for proper replacement.
6. All gaskets required for reassembly of valves, fittings, etc., shall be supplied and attached to item removed.
7. Where it is necessary to cut openings in structure such as holes in bulkheads or decks, for passage of dehumidification air, provision shall be made for readily closing these openings upon return of vessel to active status; i.e., plating of suitable dimensions, with arrangements for ready installation, properly identified and secured nearby for rapid raplacement.
8. Each dry-air outlet shall be controlled by nearest valve, as indicated, to obtain proper volume of dry air. Where no valve is available, provide orifice covers.
9. Dehumidification machine and humidistat will be obtained through regular requisitioning supply channels.
10. Fuel oil and gasoline tanks shall be preserved in accordance with TB 740-97-4.
11. Flexible hose when required for dry air supply shall conform to MIL-H-8796, 4¾" O.D. standard stock catalog. Unless otherwise indicated connections shall be by "bag" fittings or other suitable connections.
12. Shore Service Requirement:

Electrical	MAX Rate
Dehumidification Machine	440V. AC 3 KW
Lights and testing	120V. DC 20 KW

Vessels service power and lighting switchboard shall be energized through shore connections box. All circuit breakers on the switchboard shall be open except those feeding power and lighting services in use.

13. Where airtight sheet metal pipe is indicated, commercial galvanized stove pipe or down-spouting will be acceptable.
14. Dehumidified volume of vessel 33,630 cu. ft.
15. Plan applicable to Y tanker YO113/294.

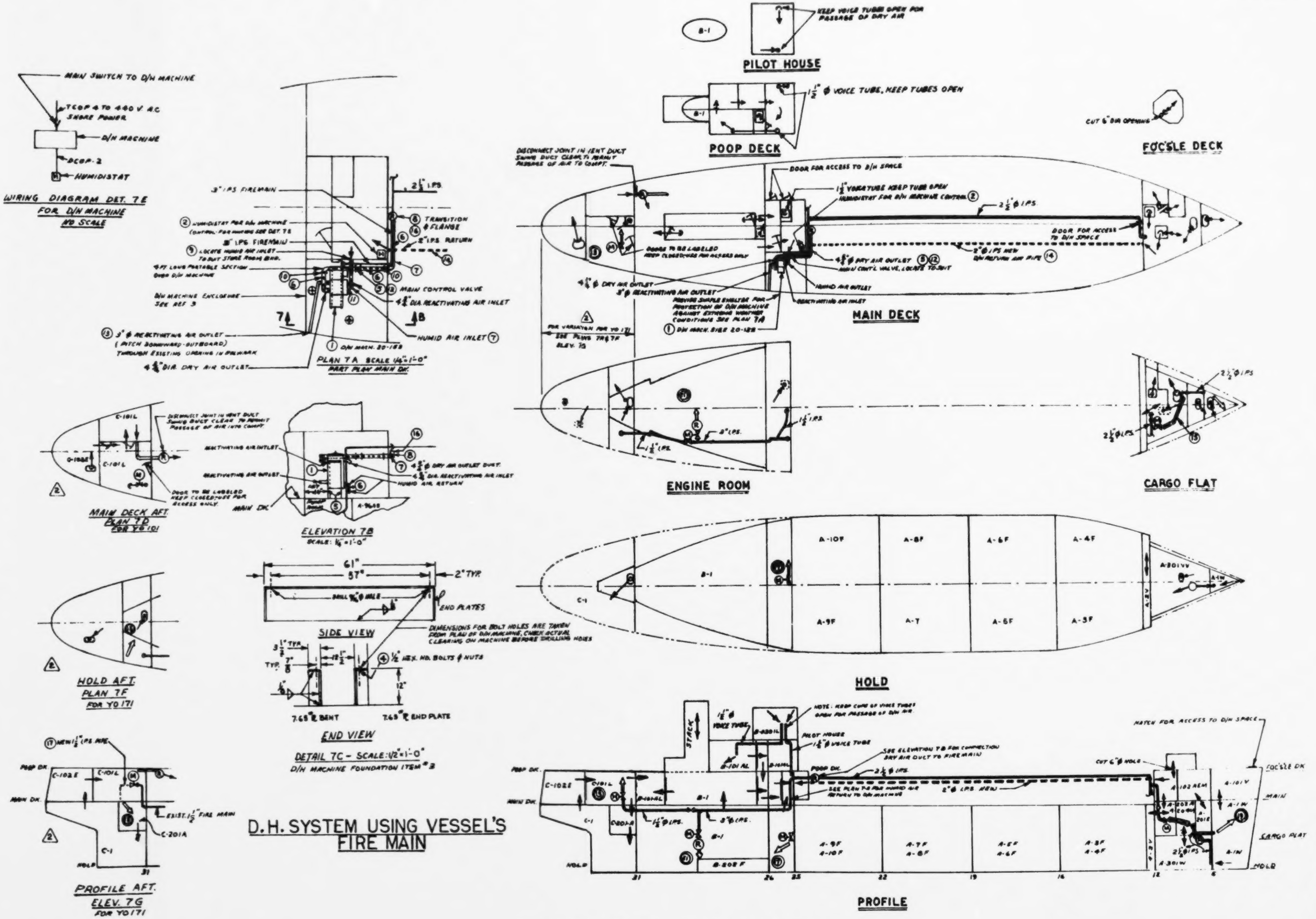
D.H. SYSTEM USING VESSEL'S FIRE MAIN
PILOT HOUSE
KEEP VOICE TUBES OPEN FOR PASSAGE OF DRY AIR
B-1
POOP DECK
1½" ϕ VOICE TUBE, KEEP TUBES OPEN
FOC'SLE DECK
CUT 6" DIA OPENING
MAIN DECK
DOOR FOR ACCESS TO D/H SPACE
2½" ϕ IPS
2" ϕ IPS NEW D/H RETURN AIR PIPE
HUMID AIR OUTLET
REACTIVATING AIR INLET
D/H MACH. SIZE 20-12B
ENGINE ROOM
CARGO FLAT
HOLD
A-10F
A-8F
A-6F
A-4F
A-9F
A-7
A-5F
A-3F
C-1
PROFILE
POOP DK.
MAIN DK.
HOLD
FOC'SLE DK
MAIN
CARGO FLAT
STACK
HATCH FOR ACCESS TO D/H SPACE
WIRING DIAGRAM DET. 7E FOR D/H MACHINE NO SCALE
MAIN SWITCH TO D/H MACHINE
TO 440 V. A.C. SHORE POWER
D/H MACHINE
HUMIDISTAT
3" IPS FIREMAIN
2½" IPS
TRANSITION & FLANGE
2" IPS RETURN
MAIN CONTROL VALVE
4⅝" DIA. REACTIVATING AIR INLET
HUMID AIR INLET
D/H MACHINE ENCLOSURE SEE REF 3
3" ϕ REACTIVATING AIR OUTLET
4⅝" DIA. DRY AIR OUTLET
D/H MACH. 20-12B
PLAN 7A SCALE ¼"=1'-0" PART PLAN MAIN DK.
MAIN DECK AFT. PLAN 7D FOR YO 101
ELEVATION 7B SCALE: ¼"=1'-0"
HOLD AFT. PLAN 7F FOR YO 171
SIDE VIEW
61"
57"
2" TYP.
END PLATES
DIMENSIONS FOR BOLT HOLES ARE TAKEN FROM PLAN OF D/H MACHINE, CHECK ACTUAL CLEARING ON MACHINE BEFORE DRILLING HOLES
½" HEX. HD. BOLTS & NUTS
END VIEW
DETAIL 7C - SCALE: ½"=1'-0" D/H MACHINE FOUNDATION ITEM #3
PROFILE AFT. ELEV. 7G FOR YO 171
EXIST. 1½" FIRE MAIN
C-201A

Figure 70. Dehumidification system for Y-tanker design 294.

PIN : 015297-000

General Notes Applicable to Figure 70.

GENERAL NOTE

Variations in the arrangement of the fire main system for various vessels can be disregarded as long as the desired dry-air distribution can be effected, and all branches not used for dry-air distribution are shut off.

GENERAL INACTIVATION NOTES

1. Prior to installation of equipment and arrangements of services, as indicated on this plan, the vessel shall be prepared in accordance with TB 740-97-4, air and water tightness.
2. All dampers, doors, hatches, valves, and other closures not shown, shall be closed. Those shown shall be open unless otherwise indicated. Valves shown, but not used for dry air control, shall be left eased off from wide open position.
3. Valves in fire main and connected services used for control of dry air flow, shall be tagged "keep closed", "keep open" or "use for control," as required.
4. Where existing vessels structure or services deviate from this drawing, air flow shall be modified to suit the intent of this plan.
5. All valves, fittings, etc., to be removed shall be tagged for proper replacement.
6. All gaskets required for reassembly of valves, fittings, etc., shall be supplied and attached to item removed.
7. Where it is necessary to cut openings in structure such as holes in bulkheads or decks, for passage of dehumidification air, provision shall be made for readily closing these openings upon return of vessel to active status; i.e., plating of suitable dimensions, with arrangements for ready installation, properly identified and secured nearby for rapid raplacement.
8. Each dry-air outlet shall be controlled by nearest valve, as indicated, to obtain proper volume of dry air. Where no valve is available, provide orifice covers.
9. Dehumidification machine and humidistat will be obtained through regular requisitioning supply channels.
10. Fuel oil and gasoline tanks shall be preserved in accordance with TB 740-97-4.
11. Flexible hose when required for dry air supply shall conform to MIL-H-8796, 4¾" O.D. standard stock catalog. Unless otherwise indicated connections shall be by "bag" fittings or other suitable connections.
12. Shore Service Requirement:

Electrical	MAX Rate	
Dehumidification Machine	440V. AC	3 KW
Lights and testing	120V. DC	20 KW

Vessels service power and lighting switchboard shall be energized through shore connections box. All circuit breakers on the switchboard shall be open except those feeding power and lighting services in use.

13. Where airtight sheet metal pipe is indicated, commercial galvanized stove pipe or down-spouting will be acceptable.
14. Dehumidified volume of vessel 33,630 cu. ft.
15. Plan applicable to Y tanker YO113/294.

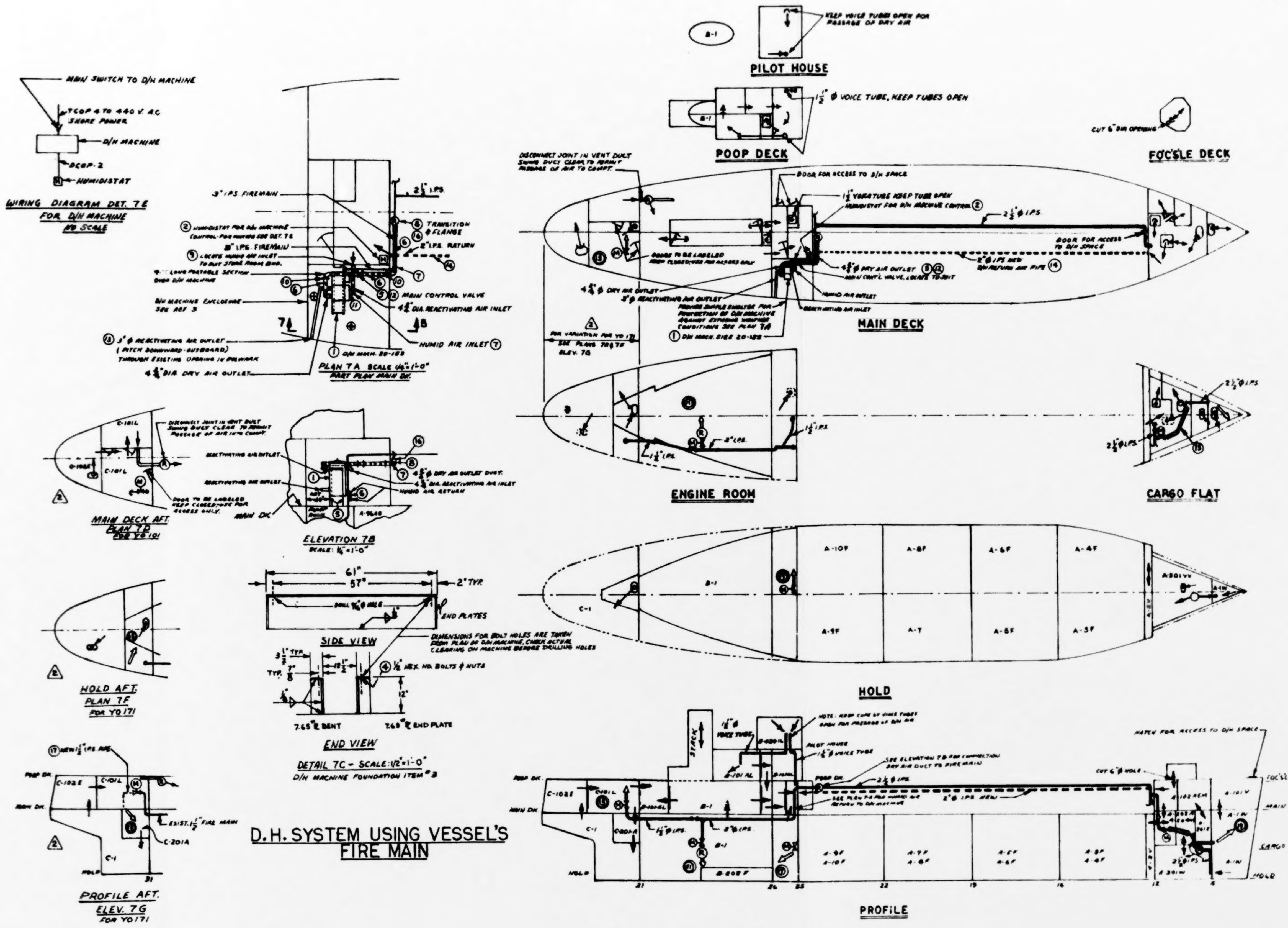
MAIN SWITCH TO D/H MACHINE
TCOP 4 TO 440 V. A.C SHORE POWER
D/H MACHINE
DCOP-2
HUMIDISTAT
WIRING DIAGRAM DET. 7E FOR D/H MACHINE NO SCALE
3" I.P.S. FIREMAIN
2½" I.P.S.
② HUMIDISTAT FOR D/H MACHINE CONTROL-FOR WIRING SEE DET. 7E
3" I.P.S. FIREMAIN
⑨ LOCATE HUMID AIR INLET TO SUIT STORE ROOM BHD.
⑧ TRANSITION
⑯ & FLANGE
2" I.P.S. RETURN
D/H MACHINE ENCLOSURE SEE REF 3
⑫ MAIN CONTROL VALVE
4¾" DIA. REACTIVATING AIR INLET
HUMID AIR INLET ⑦
⑬ 3" ϕ REACTIVATING AIR OUTLET (PITCH DOWNWARD-OUTBOARD) THROUGH EXISTING OPENING IN BULWARK
4¾" DIA. DRY AIR OUTLET
① D/H MACH. 20-183
PLAN 7A SCALE ¼"=1'-0" PART PLAN MAIN DK.
DISCONNECT JOINT IN VENT DUCT SWING DUCT CLEAR TO ADMIT PASSAGE OF AIR INTO COMPT.
C-101L
C-102E
DOOR TO BE LABELED KEEP CLOSED; USE FOR ACCESS ONLY.
MAIN DECK AFT. PLAN 7D FOR YO 101
REACTIVATING AIR INTLET
REACTIVATING AIR OUTLET
4¾" ϕ DRY AIR OUTLET DUCT
4¾" DIA. REACTIVATING AIR INLET
HUMID AIR RETURN
MAIN DK.
ELEVATION 7B SCALE: ½"=1'-0"
61"
57"
2" TYP.
END PLATES
SIDE VIEW
DIMENSIONS FOR BOLT HOLES ARE TAKEN FROM PLAN OF D/H MACHINE, CHECK ACTUAL CLEARING ON MACHINE BEFORE DRILLING HOLES
④ ½" HEX. HD. BOLTS & NUTS
12"
7.65" ℄ BENT
7.65" ℄ END PLATE
END VIEW
DETAIL 7C - SCALE: 1/2"=1'-0" D/H MACHINE FOUNDATION ITEM # 3
HOLD AFT. PLAN 7F FOR YO 171
⑰ NEW 1½" I.P.S. AIR
EXIST. 1½" FIRE MAIN
C-201A
C-1
PROFILE AFT. ELEV. 7G FOR YO 171
D.H. SYSTEM USING VESSEL'S FIRE MAIN
KEEP VOICE TUBES OPEN FOR PASSAGE OF DRY AIR
B-1
PILOT HOUSE
1½" ϕ VOICE TUBE, KEEP TUBES OPEN
POOP DECK
CUT 6" DIA OPENING
FO'C'SLE DECK
DOOR FOR ACCESS TO D/H SPACE
2½" ϕ I.P.S.
DOOR FOR ACCESS TO D/H SPACE
2" ϕ I.P.S. NEW D/H RETURN AIR PIPE ⑭
4¾" ϕ DRY AIR OUTLET
3" ϕ REACTIVATING AIR OUTLET
MAIN CONT'L VALVE, LOCATE TO SUIT
HUMID AIR OUTLET
REACTIVATING AIR INLET
① D/H MACH. SIZE 20-182
FOR VARIATION FOR YO 171 SEE PLANS 7D & 7F ELEV. 7G
MAIN DECK
1½" I.P.S.
2" I.P.S.
ENGINE ROOM
CARGO FLAT
A-10F
A-8F
A-6F
A-4F
A-9F
A-7
A-5F
A-3F
HOLD
STACK
1½" ϕ VOICE TUBE
PILOT HOUSE
POOP DK.
MAIN DK.
C-102E
B-1
B-202 F
HATCH FOR ACCESS TO D/H SPACE
CUT 6" ϕ HOLE
FOC'SLE DK
MAIN
CARGO FLAT
HOLD
21
26
25
22
19
16
12
6
PROFILE

Figure 70. Dehumidification system for Y-tanker design 294.

FIGURE 70

best copy available